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THE MINERAL INDUSTRY

of

PENNSYLVANIA

in

1961

by

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF INTERNAL AFFAIRS
Genevieve Blatt, Secretary

TOPOGRAPHIC AND GEOLOGIC SURVEY
Arthur A. Socolow, State Geologist

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The Mineral Industry of Pennsylvania

By Robert D. Thomson,[1] Mary E. Otte,[2] and Robert E. Ela [3]

PENNSYLVANIA'S mineral output in 1961 again was adversely affected by decreased markets. Output in 1961 was lower primarily because of decreases in the production of fuels and in the output of certain major nonmetallic industries. Anthracite, bituminous coal, clays, sand and gravel, and stone declined substantially in total value of output. The iron-ore, zinc, portland-cement, and lime industries were the only major mineral industries to show increases in 1961. Value of mineral production (fuels, metals, and nonmetals) totaled $792 million, a 4-percent decrease from 1960.

A new geologic map of Pennsylvania, which required 3 years to prepare, was issued by the State Topographic and Geological Survey during the year.

Employment and Injuries.—Employment in selected mineral industries as shown in table 2 was about 19 percent less than 1960. Safety was much improved, with 24 fewer fatalities and 445 fewer nonfatalities than in 1960.

The safety record of the bituminous coal industry continued to improve; the number of fatalities decreased from 28 to 22, and the number of nonfatal lost-time injuries decreased from 1,150 to 1,000. The number of fatalities per million man-hours was 0.57, compared with 0.60 in 1960. There were 0.35 fatalities per million short tons, compared with 0.43 in 1960. The number of nonfatal injuries per million man-hours was 26.13, compared with 24.77 in 1960. Of the fatalities, 20 occurred underground and 2 at strip mines. Falls of roof accounted for 11 of the underground fatalities. Of the remaining nine fatalities at underground mines, seven were from haulage, 1 from explosives, and one from mine fires. Both of the strip mine fatalities were caused by machinery.

The anthracite industry in 1961 reported 19 fatalities, compared with 35 in 1960. The number of nonfatal lost-time injuries decreased from 1,401 to 1,230. The number of injuries per million man-hours of exposure was 0.93 for fatalities and 60.12 for nonfatalities, compared with 1.43 and 57.30, respectively, for 1960. Of the 19 fatalities, 14 occurred underground, 3 at surface operations of underground mines, and 2 at stripping operations. Falls of roof caused nine of the under-

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TABLE 1.—Mineral production in Pennsylvania [1]

Mineral		1960		1961	
		Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:					
Portland	thousand 376-pound barrels	36,374	$124,122	36,635	$124,50
Masonry	thousand 280-pound barrels	[2] 2,613	7,641	2,678	7,23
Clays [3]	thousand short tons	3,557	16,536	2,999	14,40
Coal:					
Anthracite	do	18,817	147,116	17,446	140,33
Bituminous	do	65,425	345,971	62,652	323,75
Gem stones		(4)	4	(4)	
Lime	thousand short tons	1,120	16,277	1,124	16,89
Natural gas	million cubic feet	113,928	36,229	100,427	29,52
Natural gas liquids:					
Natural gasoline	thousand gallons	1,399	85	1,272	7
LP gases	do	1,580	138	1,453	11
Peat	short tons	30,837	325	27,993	29
Petroleum (crude)	thousand 42-gallon barrels	6,009	27,341	[5] 5,622	[5] 26,48
Sand and gravel	thousand short tons	13,011	21,204	12,594	19,76
Stone	do	42,136	74,168	41,834	71,34
Zinc [6] (recoverable content of ores, etc.)	short tons	13,746	3,559	23,428	5,40
Value of items that cannot be disclosed: Cobalt, copper, gold, graphite, iron ore, mica, pyrites, sericite schist, silver, soapstone (1960), and tripoli			17,429		25,35
Total Pennsylvania [7]			[2] 823,360		791,64

[1] Production as measured by mine shipments, sales, or marketable production (including consumptio by producers).
[2] Revised figure.
[3] Excludes kaolin; included with "Value of items that cannot be disclosed."
[4] Weight not recorded.
[5] Preliminary figure.
[6] Recoverable zinc valued at the yearly average price of Prime Western slab zinc, East St. Louis marke Represents value established after transportation, smelting, and manufacturing charges have been adde to the value of ore at the mine.
[7] Total adjusted to eliminate duplicating value of clays and stone in manufacturing lime and cement.

ground fatalities. Of the remaining eight fatalities at underground mines and associated surface operations, five were caused by haulage and one each by explosives, electricity, and machinery.

Three mines in Pennsylvania received top honors in the 37th National Safety Competition. National Gypsum Co.'s Bellefonte mine was the trophy winner for underground nonmetallic mines. The mine operated 239,336 man-hours without a disabling injury. The mine previously was awarded the trophy in 1949 and 1957 and received honorable mention in 1958 and 1959. The Newkirk Tunnel mine operated by Newkirk Mining Co. at Tamaqua, Schuylkill County, was the winner of the underground anthracite mine competition. The mine operated 55,181 man-hours during 1961 with only 3 temporary disabling injuries, each everaging 11 days of lost time. The Maple Creek mine in Washington County was operated by United States Steel Corp. without a disabling injury and received the top award for underground bituminous coal mines. This was the first top award for this mine in its third successive year of competition. It won fourth place in the group in 1960.

Legislation and Government Programs.—Pennsylvania enacted new legislation on strip mining of bituminous coal and anthracite to become effective January 1, 1962. The bond requirement for bituminous strip mines was increased from $300 to $400 per acre, and the minimum

otal requirement, from $3,000 to $4,000. For anthracite mines the ond was raised from $300 to $500 per acre, and the minimum total, rom $3,000 to $5,000. Further protection for homes, highways, and ublic buildings was provided by strengthening the backfilling equirements of abandoned mines.

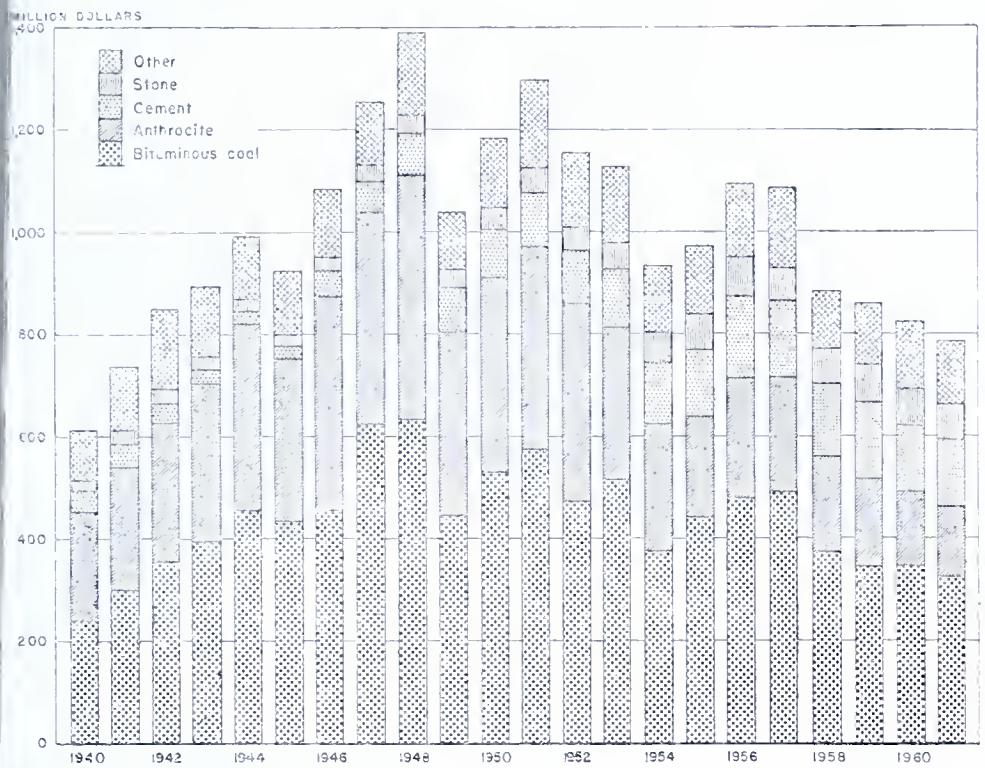

FIGURE 1.—Value of bituminous coal, anthracite, cement, and stone, and total value of mineral production in Pennsylvania, 1940–61.

TABLE 2.—Employment and injuries for selected mineral industries

Industry	1960		1961 [1]				
	Average number of men working	Total man-hours	Average number of men working	Total man-hours	Total number of lost-time injuries		Number of injuries per million man-hours
					Fatal	Nonfatal	
Anthracite	19,051	24,452,382	15,792	20,460,000	19	1,230	61.05
Bituminous coal	28,100	46,430,000	22,300	38,270,000	22	1,000	26.70
Cement [2]	3,581	8,131,699	3,146	7,112,423	--------	20	2.81
Clays	642	976,581	474	720,755	--------	28	38.85
Lime [2]	992	2,073,990	847	1,855,370	--------	43	23.18
Sand and gravel	1,480	2,777,317	1,383	2,465,060	--------	33	13.39
Stone [3 4]	3,374	6,486,512	2,956	5,695,796	1	175	30.90

[1] Preliminary figures.
[2] Includes quarries or pits producing raw materials used in manufacturing cement or lime for captive operations.
[3] Includes quarry or open-pit employees as well as crushing and screening and rock dressing operations.
[4] Excludes quarries or pits producing limestone from captive operations used in manufacturing cement or lime.

A proposed bill for transportation of coal by pipelines in Pennsylvania was passed in the house but defeated in the Senate State Government Committee. The bill cannot be reintroduced until the general session of the legislature in 1963.

Pennsylvania's first oil and gas conservation legislation was enacted during the year. The act created an Oil and Gas Commission in the State Department of Mines and Mineral Industries with authority to order the spacing of wells on application from any owner of oil or gas rights in the territory considered. Six representatives of the oil and gas industry were appointed to the commission by the Governor. Other regulations pertaining to the oil and gas industry in Pennsylvania were Acts 225, 322, and 352 and the Rules and Regulations of the Sanitary Water Board of Pennsylvania relating to disposal of waste from oil and natural gas wells.

Legislation was passed establishing a fund to insure property owners against damage to their homes from mine cave-ins. The bill authorized an agency in the mines department to write the insurance at low rates.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal (Anthracite).—The output of anthracite again decreased, totaling 17.4 million tons, a reduction of 7 percent from 1960.

Thirty-nine percent of the anthracite was mined from underground mines, and 42 percent, from strip pits. Production from deep mines was down 12 percent, while strip mining increased about 2 percent. Production from culm banks was approximately 19 percent less than in 1960, and dredging was 5 percent more.

About half of the coal produced underground was mechanically loaded—3.4 million tons, compared with 4 million tons in 1960. Hand-loaded coal totaled 3.4 million tons, compared with 3.7 million tons in 1960. A total of 132 scraper loaders, 18 more than in 1960; 27 mobile loaders, 18 less than in 1960; and 616 conveyors and pit-car loaders, 138 less than in 1960, were used to mechanically load coal mined underground.

Production from culm banks totaled 2.7 million tons, compared with 3.3 million tons in 1960. Operations were active in Lehigh, Schuylkill, Wyoming, and Sullivan Counties. The largest output, 1.4 million tons, came from the Schuylkill region.

The Lehigh, Schuylkill, and Susquehanna Rivers and their tributaries were dredged for anthracite. Production by dredges totaled 746,000 tons valued at $2.4 million. Of the total production, 620,000 tons came from the Susquehanna River, 123,000 tons from the Schuylkill River, and 3,000 tons from the Lehigh River.

Shipments of anthracite totaled 17.4 million tons. Of this total 9 million tons was shipped by truck, and 8.4, by rail. Wholesale price indexes (1947–49 equals 100) f.o.b. mines were 117.2 for chestnut, 115.1 for pea, 149.9 for buckwheat No. 1, and 195.8 for buckwheat No. 3.

Output per man per day for all types of operations was 5.63 tons, compared with 5.60 in 1960. The average weekly earning was $96.03, the average hourly earning was $2.73; and the average number of hours worked per week was 35.1.

Schuylkill County continued to be the principal center for producing anthracite—6.9 million tons in 1961. Luzerne County ranked second with production of 5.6 million tons, followed by Northumberland and Lackawanna Counties. Other counties producing anthracite were Berks, Carbon, Columbia, Dauphin, Lancaster, Lebanon, Northampton, Snyder, Sullivan, Susquehanna and Wayne.

Coal (Bituminous).—Output from the Pennsylvania bituminous coal fields decreased. Production from underground mines decreased 6 percent; that from auger mines, 3 percent; and that from strip mines, less than 1 percent. A total of 1,220 mines producing 1,000 tons or more each was active during the year. The number of underground mines and strip mines reporting production decreased by 45 and 18, respectively. One more auger mine was active in 1961 than in 1960. Approximately 66 percent of the bituminous coal output came from underground mines. A total of 40.7 million tons of the 41.4 million tons produced underground was cut by machines, including continuous miners; the remainder was cut by hand or shot from the solid. In all, 840 cutting machines and 353 continuous miners were used, compared with 1,032 and 337, respectively, in 1960.

TABLE 3.—Bituminous coal production, by types of mining and counties in 1961

(Exclusive of mines producing less than 1,000 tons annually)

County	Underground		Strip		Auger	
	Number of mines	Short tons	Number of mines	Short tons	Number of mines	Short tons
Allegheny	21	4,269,411	23	483,848		
Armstrong	45	1,489,466	46	1,418,745	11	102,047
Beaver	(1)	(1)	13	427,478	(1)	(1)
Bedford	(1)	(1)	(1)	(1)		
Blair	2	5,599	1	45,217		
Bradford			(1)	(1)		
Butler	22	252,667	41	1,779,966	6	42,947
Cambria	87	5,587,343	21	436,379	1	2,415
Cameron			1	58,170		
Centre	13	43,464	14	768,570		
Clarion	8	37,487	30	2,940,570	1	5,370
Clearfield	72	1,218,933	101	5,298,289	11	121,954
Clinton	3	6,397	5	400,704		
Elk	15	87,817	8	247,819	1	9,600
Fayette	(1)	(1)	21	321,819	(1)	(1)
Greene	18	9,522,117	4	25,997		
Huntingdon	4	13,350	5	22,015		
Indiana	72	4,058,955	29	561,345	4	24,592
Jefferson	32	283,444	29	977,957	5	43,039
Lawrence	1	7,600	17	590,018	3	34,156
Lycoming	2	6,010	3	52,351		
McKean			(1)	(1)		
Mercer	2	13,435	11	914,967		
Somerset	100	1,034,487	47	1,061,278		
Tioga	2	19,974	6	265,009		
Venango	1	1,137	(1)	(1)		
Washington	21	9,370,712	24	930,945	3	43,759
Westmoreland	43	3,133,133	25	175,768	(1)	(1)
Undistributed	49	979,709	10	539,624	4	34,721
Total	635	41,442,647	535	20,744,848	50	464,600

[1] Figure withhold to avoid disclosing individual company confidential data; included with "Undistributed."

A total of 1,857 locomotives (2,046 in 1960), 294 conveyors (338 in 1960), 966 shuttle cars (1,013 in 1960), 19 rubber-tired tractors, 40 rubber-tired mine cars, 36,900 rail mine cars, and 19 shuttle buggies were used for underground haulage. Pennsylvania underground production continued to be highly mechanized, with 12.9 million tons cut using 840 cutting machines, 3 millions tons cut by 40 continuous mining machines and loaded directly onto conveyors, and 24.9 million tons cut by 313 continuous mining machines loading directly into shuttle cars. Mobile loaders were the principal moving device, loading 917,000 tons into mine cars, 455,000 tons onto conveyors, and 9,100,000 tons into shuttle cars. Handheld and post-mounted drills totaled 712 and drilled 8.2 million tons of coal; 66 mobile drills were used to drill 4.3 million tons of coal. In addition, 286 rotary and 417 percussion roof bolting drills and 171 other types of rock drills were used.

Production from strip mines decreased 131,000 tons, compared with 1960. Bituminous coal was stripped and loaded using electrical, diesel-electric, diesel, and gasoline power shovels and draglines. Of the 941 power shovels in use (5 more than in 1960), 867 had a dipper capacity of less than 3 cubic yards; 69, 3 to 5 cubic yards; 3, 6 to 12 cubic yards; and 2, more than 12 cubic yards. A total of 376 draglines was used (14 more than in 1960); 113 had a dipper capacity of less than 3 cubic yards; 163, 3 to 5 cubic yards; 89, 6 to 12 cubic yards; and 11, more than 12 cubic yards. Thirteen carryall scrapers were used; 1 had a capacity of less than 3 cubic yards; 1, 3 to 5 cubic yards; 8, 6 to 12 cubic yards; and 3, over 12 cubic yards. In addition, 794 bulldozers, 117 horizontal power drills, and 120 vertical power drills were used. The average distance from the pit to tipple was 6 miles. A total of 1,522 trucks or tractor-trailers were used at the stripping operations, having an average capacity of 13 tons per unit.

Rail tracks in the underground mines on main lines totaled 1,390.2 miles and 329.3 on all others.

The number of auger mines totaled 50, at which a total of 55 augers was used.

Bituminous coal produced from underground mines was shipped chiefly by rail or water (36.1 million short tons) and by truck (3.7 million short tons). Underground coal sold on the open market totaled 17.8 million tons and had an average value per ton of $5.17 ($5.34 in 1960). The average value of captive coal mined underground was $6.58 per ton. Shipments of strip coal by truck totaled 7.6 million tons, and shipments by rail or water totaled 13 million tons. Strip-mined coal had an average value of $3.60 per ton.

Of the auger mine production, 196,000 short tons was shipped by rail or water and 252,000 by truck. The value per ton of auger-mine coal sold on the open market averaged $3.12; average per ton for all coal from auger mines was $3.15.

Eighty-one preparation plants were active, 3 less than in 1960. A total of 37.7 million tons of coal was cleaned, compared with 39.6 million in 1960. Of the total, 33.8 million tons came from underground mines, 3.9, from strip mines, and the remainder, from auger mines. Of the raw coal mechanically cleaned, 42 million tons was wet washed, producing 6.8 million short tons of cleaned coal, using jigs, and 25.5 million tons, using other wet washing methods. A total of 6.1 million short tons of raw coal was cleaned

using pneumatic methods, producing 5.4 million tons of cleaned coal.

A total of 27.5 million tons of coal was crushed; this represented 65 percent of the total production at mines having crushing facilities. Of the total production at these mines, 5.9 million tons was treated—1 million tons, with calcium chloride; 3 million tons with oil; 1.1 million tons, with both calcium chloride and oil; and 756,000 tons, with other materials.

Underground mines were worked in 25 counties, strip mines, in 28 counties, and auger mines, in 13 counties. Greene County continued to be the leading producer from underground mines; other leading counties in order of decreasing tonnage produced were Washington, Cambria, Allegheny, Indiana, Westmoreland, Armstrong, Clearfield, and Somerset. Clearfield County continued as the leading producing county from strip mines, followed by Clarion, Butler, Armstrong, and Somerset. Clearfield County replaced Armstrong County as the leading producer from auger mines.

Coke and Coal Chemicals.—Production from oven-coke operations decreased 6 percent, and from beehive coke ovens, 34 percent, compared with 1960.

Twelve plants, two less than in 1960, produced 13.3 million tons of oven coke, using 3,720 slot-type ovens to carbonize 19 million short tons of coal. Yield of coke from coal was 69.94 percent, compared with 69.27 percent in 1960. The average value of oven coke at the ovens was $16.14 per short ton, $1.00 less than in 1960. Of the oven-coke produced in Pennsylvania, a total of 13.3 million short tons was used at blast furnace plants, 156,000 tons at foundries, 147,000 tons at other industrial plants, and 24,000 tons for residential heating.

Twenty-seven beehive coke plants were in existence at yearend, but only 9 were active. A total of 1,684 beehive coke ovens was operated to produce 454,000 tons of coke from 735,500 tons of coal. Yield of coke from coal decreased from 62.86 percent to 61.73 percent. The average value of beehive coke at the ovens was $13.76 per ton, $0.42 less than that reported in 1960. The beehive coke was used in blast furnaces, by foundries, for residential heating, and for sundry industrial uses, with blast furnaces consuming the major portion of the production.

Coal produced in Kentucky, Pennsylvania, Virginia, and West Virginia was used at oven coke plants in Pennsylvania. Of the total, 57 percent came from mines in Pennsylvania, and 36 percent, from mines in West Virginia. Seventy-three percent of the coal used at oven coke plants was high volatile, 10 percent, medium volatile, and 17 percent, low volatile.

Peat.—Pennsylvania ranked fifth in value of peat production among the 22 producing States. Output in 1961 totaled 28,000 short tons and $291,000. Humus, reed-sedge, and moss peats were produced. Operations were active in Erie, Lawrence, Luzerne, and Wayne Counties. Wayne County replaced Luzerne County as the leading producer.

Petroleum and Natural Gas.—Output of crude petroleum decreased 6 percent in quantity and 3 percent in value. The average value of crude

petroleum at yearend was $4.63 per barrel from the northern (Bradford) district, $4.35 from the middle (Venango) district, and $4.08 from the southwestern district.

Output of natural gas decreased 12 percent in quantity and 19 percent in value, compared with 1960.

Exploration resulted in the discovery of four new gasfields, six new gas pools, and two deeper gas pools.[4] The outstanding discovery was the Whippoorwill field in Cambria County on the southeast flank of the Sabinsville anticline. Other important discoveries were the Pavia field in Blair and Bedford Counties, the Spruell field in Fayette County, the Brooky pool in Crawford County, the Lundys Lane pool in Erie County, and the Bailey and Clarke pools in Westmoreland County. The greatest density of deep drilling occurred in Crawford County where 21 wells were drilled. Armstrong County again had the greatest number of shallow-sand completions, outside of the secondary-recovery areas, with the drilling of 46 wells. No new shallow-sand field or pool was discovered during the year.

There were 679 new gas wells drilled and 30 wells deepened. Of the 679 completions, 642 were in proven fields and 37 were exploratory tests. Of the 642 proven field wells, 211 were oil, 182 water-input, 172 gas, 8 gas-input, 10 gas-storage, and 59 dry holes. Of the 211 oil wells, 168 were drilled in connection with secondary-recovery operations.

Of the 37 exploratory tests, 12 were gas and 25 were dry. Of the 311 completions drilled outside of underground gas storage or secondary-recovery operations, 84 were dry, or 1 dry hole for slightly over 3.7 completions. The total footage drilled during the year was 1,722,955.

Acreage held by major oil and gas companies for deep oil and gas exploration amounted to 3,649,000 acres at yearend. A number of geological field parties were active; seismic crews logged 133 weeks. This was an increase of 28 percent over crew-weeks logged in 1960.

The proved recoverable crude-oil reserve was estimated at 102 million barrels on December 31—5.6 million barrels less than was reported at yearend 1960. The proved recoverable reserve of natural gas was 1,168,855 million cubic feet on December 31—23.6 percent less that at yearend 1960. Of the natural gas reserve, 691,114 million cubic feet was nonassociated reserve, 21,540 million was dissolved, and 456,201 million was stored in underground reservoirs.

Capacity for underground natural gas storage grew at a fast rate in 1961. Total capacity of reservoirs was estimated at 590.3 million cubic feet. The major portion of the storage was in Potter, Clinton, Cambria, Tioga, Washington, Greene, Armstrong, Indiana and Allegheny Counties.

Natural Gas Liquids.—Natural gas liquids produced totaled 2,725,000 gallons, a decrease of 9 percent. Output consisted of liquified petroleum gas and ethane (manufactured at natural-gasoline plants), totaling 1,453,000 gallons, and natural-gasoline and cycle products, totaling 1,272,000 gallons. Average value for liquified petroleum gases was $0.079 per gallon and for natural-gasoline and cycle products, $0.058.

[4] Lytle, William S., Addison S. Cate, William G. McGlade, and Walter R. Wagner, Oil and Gas Developments in Pennsylvania in 1961. Pa. Topographic and Geol. Survey, Progress Report 160, 1962, 55 pp.

Reserves of natural gas liquids on December 31 were estimated at 2.1 million barrels—about 40,000 barrels less than at the end of 1960. Reserves of liquid hydrocarbon were estimated at 104.1 million barrels.

NONMETALS

Cement.—Output of the cement industry decreased. Two percent less portland cement was produced and 7 percent less masonry cement. However, shipments of both portland and masonry cement increased slightly over those of 1960.

Kilns operated at approximately 65 percent of capacity and produced 36.6 million barrels of portland cement. Of the 23 active plants, 67 percent of capacity was dry process, and 33 percent, wet process. The industry consumed 893 million kilowatts of electrical energy, about 26 million kilowatts less than in 1960. Seventy-eight percent of the electrical energy was purchased from public utility companies, compared with 72 percent in 1960. Stocks of portland cement decreased from 5.7 million barrels at the beginning of the year to 5.3 million barrels at yearend.

Masonry cement was produced at 16 of the plants that also produced portland cement, chiefly in Lehigh and Northampton Counties.

The principal raw materials used for manufacturing portland cement were cement rock and limestone. Totals of 7.2 million short tons of cement rock and 3 million of limestone were used. In addition, the following tonnages of raw material were used: Gypsum, 282,700; sand, 191,700; clays, 165,100; and iron materials, 57,000. Slag, slate, carbon black, sludge, air-entraining compounds, and grinding aids also were used.

Portland cement was shipped to consumers in Pennsylvania, 44 other States, the District of Columbia, and foreign countries. Thirty-four percent of the shipments went to Pennsylvania; 23 percent, to New Jersey; 18 percent, to New York; 6 percent, to Ohio; 6 percent, to Connecticut; 3 percent, to Maryland; 2 percent each, to Delaware, Massachusetts, and West Virginia; and 1 percent, to Virginia.

Distribution of portland cement shipments by use was as follows: 20.2 million barrels to ready-mixed concrete companies, 7 million barrels to concrete product manufacturers, 5.8 million barrels to building material dealers, 2.7 million barrels to highway contractors, 467,000 barrels to miscellaneous consumers, 444,000 barrels to other contrac-

TABLE 4.—Portland cement shipments, by counties

County	Number of plants in 1961	1960		1961	
		Barrels	Value	Barrels	Value
Lehigh	4	6,800,637	$22,739,563	6,606,106	$21,718,671
Northampton	12	17,308,898	58,327,559	18,156,481	61,222,857
Allegheny	2	6,323,448	21,754,945	6,391,919	21,831,403
Lawrence	2				
Berks	1	5,940,519	21,299,445	5,480,152	19,732,766
Butler	1				
Montgomery	1				
York	1				
Total	24	36,373,502	124,121,512	36,634,658	124,505,697

tors, and 19,000 barrels to Federal, State, and local government agencies.

Masonry cement was shipped to consumers in eastern Pennsylvania, 22 other States, and the District of Columbia. Thirty-nine percent was consumed in Pennsylvania; 18 percent, in New Jersey; 15 percent, in New York; and 13 percent, in Ohio.

Clays.—Output of clays declined to the lowest level since 1945 and was well below the record high established by the industry in 1956. A sharp drop in consumption by the refractories and construction industries resulted in a 16-percent decrease in clay production from that in 1960. Operators reported clay mined or shipped from stocks from 148 operations during the year. Output from 22 underground mines, 10 less than in 1960, accounted for 18 percent of the total clay production; the remainder came from open pits. Production was recorded in 32 counties: fire clay, in 18 counties; miscellaneous clay, in 27 counties; and kaolin, in 2 counties. Clearfield County continued as the principal clay producing county, followed in decreasing order by Lawrence, Schuylkill, Armstrong, and Jefferson Counties. Production of fire clay dropped 21 percent to the lowest annual rate of production since 1945. This decline was due to a 21-percent drop in demand for refractory materials by the steel, glass, and foundry industries and a 19-percent decrease in production of heavy clay products. Contributing factors for the decline were the lowered demand for clays used in the manufacture of cement, lightweight aggregate, and other heavy clay products. Miscellaneous clay output exceeded that of fire clay for the second year. All of the miscellaneous clay came from open pits.

Kaolin production continued in Cumberland and Blair Counties. Output increased 8 percent over 1960; this was the first increase recorded in over a decade.

TABLE 5.—Clays sold or used by producers, by kinds and uses

(Short tons)

Uses	Fire clay		Miscellaneous clay	
	1960	1961	1960	1961
Pottery and stoneware: Art pottery, flowerpots, and glaze slip			12,310	(1)
Refractories:				
Firebrick and block	837,233	684,376	(1)	
Fire-clay mortar	21,307	14,109		
Clay crucibles	19,511	13,098		
Foundries and steelworks	107,908	58,273	(1)	(1)
Heavy clay products	748,298	606,341	1,306,110	(1)
Portland and other hydraulic cements			152,126	136,430
Other uses	13		(1)	(1)
Undistributed	[2] 123,711	[2] 88,423	[3] 228,901	[3] 1,398,410
Total	1,857,981	1,464,620	1,699,447	1,534,840

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes floor and wall tile (1960), high-alumina brick, glass refractories, and other refractories.
[3] Includes floor and wall tile, lightweight aggregate, linoleum and oilcloth, and items indicated by footnote 1.

TABLE 6.—Clays sold or used by producers in 1961, by counties

County	Short tons	Value	Tyes of clay
Adams	71,150	$36,150	Miscellaneous clay.
Allegheny	108,785	(1)	Do.
Armstrong	212,789	2,157,671	Fire clay, miscellaneous clay.
Butler	15,710	23,565	Miscellaneous clay.
Cambria	43,014	228,581	Fire clay, miscellaneous clay.
Chester	94,390	117,988	Miscellaneous clay.
Clearfield	416,909	2,976,749	Fire clay, miscellaneous clay.
Columbia	12,398	22,316	Miscellaneous clay.
Fayette	98,404	348,024	Fire clay, miscellaneous clay.
Greene	3,000	3,750	Miscellaneous clay.
Indiana	24,635	50,502	Fire clay.
Luzerne	43,301	86,602	Miscellaneous clay.
Montgomery	86,106	140,800	Miscellaneous clay, fire clay.
Somerset	68,491	576,424	Fire clay.
Washington	10,726	26,815	Miscellaneous clay.
Undistributed [2]	1,689,652	7,605,941	
Total [3]	2,999,460	14,401,878	

[1] Figure withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[2] Includes Beaver, Berks, Blair, Bucks, Centre, Clarion, Clinton, Dauphin, Elk, Huntingdon, Jefferson, Lancaster, Lawrence, McKean, Monroe, Northumberland, Schuylkill, Snyder, and York Counties, and items indicated by footnote 1.
[3] Incomplete total; excludes kaolin produced in Blair and Cumberland Counties.

Gem Stones.—Eastern Pennsylvania continued to be the most popular source of semiprecious gem materials in the State. Semiprecious gem stones and mineral specimens were reported to have been found in Berks, Chester, Lancaster, Lebanon, Lehigh, Montgomery, and Schuylkill Counties. Most of the mineral specimens were collected by members of Pennsylvania and out-of-State mineral and lapidary clubs.

Graphite.—Crystalline graphite was recovered from schist in Chester County; production was less than that in 1960. The processed material was marketed for use in crucibles and foundry facings. In addition, manufactured (artificial) graphite powder and products were produced at a plant in St. Marys. The graphite powder was sold to basic steel manufacturers, iron and steel foundries, and to the electrochemical industry.

Iron Oxide Pigments.—Sulfur mud continued to be the only crude iron oxide pigment produced in Pennsylvania, with the output increasing in both tonnage and value. The crude material was produced in Cambria County.

Pennsylvania continued to be the leading State in producing finished natural and manufactured iron oxide pigments. Production was slightly less than in 1960. Principal natural iron oxide pigments, based on value, were brown iron oxide, burnt umber, red iron oxide, and burnt sienna. Leading manufactured iron oxide pigments were red, yellow, Venetian red, and brown. The finished natural and manufactured iron oxide pigments were produced at one plant in Carbon County and two plants in Northampton County.

Lime.—Output of lime increased slightly over 1960. Shipments of building lime were up 8 percent; agricultural lime, up 2 percent; chemical industrial lime, down less than 1 percent; and refractory lime, down 3 percent. Of the total lime sold or used, 75 percent was quicklime.

Twenty companies, 1 less than in 1960, operated 23 plants in 16 counties. Centre County continued as the leading producer with 45 percent of the State lime shipments. Centre, York, Lebanon, Chester, Butler, and Montgomery, in decreasing order, each produced lime valued in excess of $1 million. Most of the lime was consumed within the State (61 percent), but large quantities were shipped to Maryland (8 percent), New Jersey (8 percent), Ohio (6 percent), New York (5 percent), Delaware (3 percent), and Maine (2 percent).

TABLE 7.—Lime sold or used by producers, by counties

County	1960		1961	
	Short tons	Value	Short tons	Value
Centre	504,024	$6,898,746	500,707	$6,746,673
Dauphin	8,400	134,400	7,900	126,400
Franklin	2,301	17,487	1,557	11,833
Fulton	227	2,043	593	5,337
Juniata	2,100	21,000		
Lancaster	(1)	(1)	1,198	16,772
Lebanon	176,000	2,493,500	142,000	2,070,000
Mifflin	4,315	46,363	4,349	42,521
Northumberland	475	4,000	417	3,450
Snyder	(1)	(1)	739	6,073
Undistributed [2]	422,621	6,658,973	464,698	7,867,275
Total	1,120,463	16,276,512	1,124,158	16,896,334

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes Armstrong, Bedford, Blair, Butler, Chester, Montgomery, and York Counties, and counties indicated by footnote 1.

Magnesium Compounds.—Magnesium carbonate, produced at Plymouth Meeting from raw dolomite, was used in producing precipitated magnesium oxide. Sales of magnesium compounds were less primarily because of lower demand for their use in manufacturing rubber and magnesium oxide insulation.

Mica.—Output of mica continued to increase primarily because of a greater demand for ground mica for use by the paint and rubber industries. The mica was mined and processed near Glenville and marketed for use in paints, as a mold lubricant for the rubber industry, and for use in welding rods.

Perlite (Expanded).—Sales of expanded perlite (15,703 short tons valued at $1,036,730) were less than in 1960. Use was in building plaster, as concrete aggregate, as loose-fill insulation, and as a soil conditioner, filler, and filter aid. The crude perlite, shipped from mines in Western States was expanded at plants in Allegheny, Delaware, Lehigh, Montgomery, and York Counties.

Pyrite.—A greater tonnage of pyrite was produced than in 1960. Pyrite concentrate, obtained as a byproduct of iron ore mining at two mines in eastern Pennsylvania, was processed to recover the pyrite and cobalt.

Sand and Gravel.—Sand and gravel output declined for the second consecutive year and was 3 percent less in quantity and 7 percent less in value than in 1960. Pennsylvania ranked 17th in tonnage and 11th in value of sand and gravel production. A total of 109 commercial operations was active, of which 34 produced 100,000 or more tons.

Production from 34 plants totaled 9,884,585 short tons valued at $15,804,195, representing 78 and 80 percent, respectively, of the State total. Sixteen operations, each producing in excess of 200,000 tons, accounted for 61 percent of the total production and 65 percent of the value. The uses of sand and gravel remained similar to those of 1960; 86 percent of the commercial output was used as building and paving sand and gravel; 56 percent was consumed as building material, and 30 percent, as paving material. South central Pennsylvania, chiefly Huntingdon and Mifflin Counties, continued as the primary area for industrial sand. Industrial sand represented 20 percent of the total sand produced, and production increased 2 percent over that of 1960. Of the total commercial sand and gravel production, 8 percent was transported by rail, 21 percent by water, and 71 percent by truck. Bucks County continued as the principal producer of sand and gravel; output decreased 3 percent from that of 1960. Other leading counties in decreasing order were Armstrong, Lycoming, Huntingdon, and Beaver.

TABLE 8.—Sand and gravel sold or used by producers, by classes of operations, and by uses

Class of operation and use	1960		1961	
	Short tons	Value	Short tons	Value
Commercial operations:				
Sand:				
Molding	(1)	(1)	147,772	$427,479
Building	3,802,203	$5,461,055	3,820,455	5,102,350
Paving	2,063,029	3,106,240	1,852,766	2,657,086
Fire or furnace	141,183	395,826	226,666	469,668
Engine	(1)	(1)	65,063	171,729
Fill	101,233	117,341	79,813	58,706
Undistributed [2]	1,241,546	4,394,246	1,095,980	3,815,356
Total	7,349,194	13,474,708	7,288,515	12,702,374
Gravel, construction:				
Building	3,369,786	4,557,919	3,175,350	4,169,641
Paving	1,992,568	2,877,280	1,941,437	2,747,338
Fill	102,029	89,725	93,294	63,316
Undistributed [3]	29,034	32,436	36,418	41,173
Gravel, miscellaneous	84,710	70,039	59,109	42,095
Total	5,578,127	7,627,399	5,305,608	7,063,563
Total sand and gravel	12,927,321	21,102,107	12,594,123	19,765,937
Government-and-contractor operations:				
Gravel: Fill	83,855	102,086	----------	----------
Total	83,855	102,086	----------	----------
Grand total	13,011,176	21,204,193	12,594,123	19,765,937

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes glass, grinding and polishing, blast, ferrosilicon, ground, and other sand, and items indicated by footnote 1.
[3] Includes railroad ballast and other uses.

Slag (Iron-Blast Furnace).—Output of blast furnace slag decreased from 7,804,000 in 1960 to 6,699,000 short tons. The value of output also decreased, from $11,651,000 to $11,352,000. Pennsylvania continued to be the leading producer of blast-furnace slag with 26 percent of the U.S. tonnage. Of the slag processed in Pennsylvania, 5.5 mil-

TABLE 9.—Sand and gravel sold or used by producers, by counties

County	1960		1961	
	Short tons	Value	Short tons	Value
Allegheny	121,113	$257,290	205,136	$353,997
Armstrong	1,516,924	3,096,258	1,462,726	3,010,348
Bedford	(1)	(1)	4,590	12,622
Blair	42,822	101,093	(1)	(1)
Bradford	(1)	(1)	290,002	405,602
Butler	161,200	221,400	136,196	158,037
Cambria	7,950	7,950	8,740	20,717
Clinton	83,855	102,086		
Crawford	103,616	164,174	107,813	122,527
Cumberland	175,180	302,582	144,846	224,784
Fayette	166,928	280,106	119,940	202,524
Jefferson	18,857	7,911	10,000	4,200
Lackawanna	(1)	(1)	237,546	294,471
Lancaster	229,846	491,678	219,321	394,708
Luzerne	428,859	542,523	348,173	438,494
Mercer	314,821	484,178	401,165	537,918
Monroe	63,187	70,888	61,668	66,158
Northampton	425,168	498,163	523,905	627,011
Northumberland	6,853	8,096	5,215	10,025
Schuylkill	118,443	284,564	122,734	271,340
Snyder	102,940	102,801	(1)	(1)
Somerset	(1)	(1)	770	2,310
Venango	(1)	(1)	309,681	589,126
Wayne	2,678	2,411	1,679	2,017
Wyoming	(1)	(1)	448,118	438,374
York	279,647	395,222	256,725	382,111
Undistributed [2]	8,640,289	13,782,819	7,167,434	11,196,516
Total	13,011,176	21,204,193	12,594,123	19,765,937

[1] Included with "Undistributed" to avoid disclosing individual company confidential data.
[2] Includes Beaver, Berks, Bucks, Carbon, Columbia, Dauphin, Elk, Erie, Forest, Franklin, Fulton, Huntingdon, Lawrence, Lycoming, McKean, Mifflin, Montgomery, Montour, Philadelphia, and Warren Counties, unspecified counties, and counties indicated by footnote 1.

lion short tons was screened, air-cooled slag used chiefly for highway and airport construction, portland-cement concrete construction, bituminous pavements, and railroad ballast.

Stone.—Output of stone, including slate and oystershell, decreased in both tonnage and value. The lower output was due mainly to a decline in demand for dimension building stone and crushed and broken stone as riprap, fluxing stone, refractory material, and for miscellaneous uses. The demand for concrete aggregate, railroad ballast, and agricultural stone, increased.

Stone was produced in 48 counties, two less than in 1960. Northampton County continued to be the leading stone producing county. Counties having a production totaling over $3 million, in decreasing order, were Northampton, Montgomery, York, Lawrence, Adams, Centre, Chester, Lancaster, and Berks. In addition, Bucks, Dauphin, Lebanon, Delaware, and Lehigh Counties each produced over $2 million worth of stone, while Blair, Butler, Fayette, Westmoreland, and Mifflin Counties produced over $1 million each.

Output of basalt increased 16 percent in both tonnage and value, mainly because of a 17-percent increase in its use as concrete aggregate and a 19-percent increase in its use as railroad ballast. Less basalt was used as dimension building stone, and none was reported used as curbing and flagging stone, or as riprap. Dimension stone and crushed stone were produced in Bucks, Chester, and Montgomery Counties; crushed stone only was produced in Adams, Berks, Dauphin, and Delaware Counties. Delaware County led in production of crushed

stone, followed by Mongomery County; Chester County was the leading source of dimension stone.

Slightly more granite was sold in 1961 than in 1960. The granite was marketed both as dimension stone and crushed stone. The use of granite as concrete aggregate increased; other uses, such as rough construction dimension stone and rubble, declined. No material was reported marketed as dressed dimension stone or riprap in 1961. Dimension granite was produced in Delaware County, and both dimension and crushed stone, in Montgomery County. No production was reported in Philadelphia County in 1961.

Output of miscellaneous stone for dimension use decreased, whereas output of crushed stone increased. The decrease in dimension miscellaneous stone was due mainly to a lower demand for rough and dressed construction material. Production of crushed miscellaneous stone increased primarily owing to a 73-percent increase in demand for its use as concrete aggregate. Dimension stone was produced in Delaware and Montgomery Counties, and crushed stone, in Montgomery and Bucks Counties. Delaware was the leading source of dimension stone, and Montgomery County, the leading source of crushed stone.

Oystershell was again collected in Berks County and marketed as poultry grit.

Sandstone, the third ranking stone in both tonnage and value, showed an overall decline in output. Crushed sandstone output decreased 10 percent in tonnage and 20 percent in value; less was used as concrete aggregate, railroad ballast, refractory material, and for sundry uses. Riprap was the only use that showed an increase in 1961. About 3 percent less dimension sandstone was marketed, with less material used as rubble and rough architectural stone. More stone was used than in 1960 as rough construction stone and as curbing and flagging stone. Sandstone was produced in 27 counties of which 21 produced crushed and broken stone and 12, dimension stone. New operations were reported in Somerset County, whereas no production was reported in Tioga County as there had been in 1960. Westmoreland continued to be the leading county for tonnage of crushed sandstone produced, followed in decreasing order by Luzerne, Blair, and Fayette Counties. Montgomery produced more dimension stone than any other Pennsylvania county. Chester and Delaware Counties also were important counties for the production of dimension sandstone. Government-and-contractor production of crushed stone was not reported in 1961.

Limestone, the ranking stone in tonnage and value, decreased 2 percent in tonnage and 4 percent in value. Limestone was marketed as both dimension and crushed stone. A 700,000-ton drop in the use of limestone as fluxing stone was a leading factor in the lower demand for crushed limestone. Also, less limestone was used as riprap and for miscellaneous uses than in 1960. Slightly more material was marketed as concrete aggregate, railroad ballast, agricultural stone, and as refractory material. The demand for dimension limestone also increased.

Crushed limestone was produced in 37 counties, the same number as in 1960. Northampton continued to lead in the production of crushed limestone, with 4.7 million tons, compared with 5 million tons in 1960. Other leading counties, each producing over 2 million tons, were, in decreasing order, Montgomery, Lawrence, York, Lancaster, and Lehigh. Value-wise, the five leading counties in decreasing order were Montgomery, York, Lawrence, Northampton, and Centre. Dimension limestone came only from Bucks County.

Output of slate for dimension uses decreased 4 percent in tonnage and increased 9 percent in value. Use of slate for roofing, billiard table tops, school slates, structural and sanitary purposes, and as flagging stone increased, but use of slate for blackboards and bulletin boards decreased. Dimension slate came from Northampton and Lehigh Counties, with the major portion of the production coming from Northampton County. Crushed slate was marketed from Northampton, Lycoming, and York Counties; total sales were less than in 1960.

Output of natural and artificially colored roofing granules decreased in both tonnage and value compared with 1960, owing mainly to decreased demand for natural granules. Of the total production, artificially colored granules represented 80 percent, compared with 76 percent in 1960. Plants were active in Adams, Beaver, and York Counties.

TABLE 10.—Stone sold or used by producers, by uses

Use	1960		1961	
	Short tons	Value	Short tons	Value
Dimension stone:				
Building stone	153,304	$1,142,813	143,644	$1,128,525
Curbing and flagging	12,493	306,897	11,372	278,501
Other uses	48,834	3,165,132	46,891	3,445,385
Total	214,631	4,614,842	201,907	4,852,411
Crushed and broken stone:				
Riprap	51,842	74,834	(1)	(1)
Concrete and road metal	20,363,634	31,284,466	21,342,700	31,563,484
Furnace flux (limestone)	5,637,623	10,657,545	4,924,382	8,953,062
Railroad ballast	569,253	913,223	641,882	1,003,118
Agricultural	950,509	2,852,574	1,078,392	2,973,326
Other uses [2]	14,348,797	23,770,386	13,645,002	21,998,505
Total	41,921,658	69,553,028	41,632,358	66,491,495
Grand total	42,136,289	74,167,870	41,834,265	71,343,906

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes refractory and items indicated by footnote 1.

Sulfur.—Byproduct sulfur continued to be recovered in the liquid purification of oil refinery gases obtained from domestic and foreign sources. Shipments totaled 35,795 long tons of sulfur equivalent valued at $836,000. This was slightly less than that marketed in 1960. The Sinclair Refining Co., Marcus Hook refinery, and the Gulf Oil Corp., Philadelphia refinery, used the Claus process to recover sulfur. Sulfur also was recovered at the Sun Oil Co., Marcus Hook refinery, using a two-stage catalytic oxidation of hydrogen sulfide.

TABLE 11.—Stone sold or used by producers, by counties

County	1960		1961	
	Short tons	Value	Short tons	Value
Adams, Cumberland, York	4,966,944	$10,520,679	5,001,344	$10,420,308
Armstrong	(1)	(1)	50,111	100,094
Berks	2,559,740	3,431,652	2,672,193	3,409,104
Blair, Huntingdon	1,196,838	3,107,357	1,149,020	2,070,070
Bucks	(1)	(1)	1,513,394	2,756,661
Butler	829,202	1,647,700	715,986	1,390,315
Cambria	4,800	15,400	4,000	14,000
Carbon, Monroe, Schuylkill	497,376	1,901,063	555,742	1,847,976
Centre	1,889,695	3,806,576	1,972,355	3,950,176
Chester	2,341,341	4,770,842	2,087,985	3,890,230
Dauphin	1,467,521	2,332,238	1,478,325	2,313,959
Fayette, Somerset	530,651	1,135,453	772,894	1,592,048
Franklin	608,415	994,155	533,193	854,227
Juniata, Mifflin, Snyder	798,124	1,539,381	799,172	1,458,543
Lackawanna	5,072	10,144	(1)	(1)
Lancaster	2,292,968	3,263,486	2,586,503	3,733,888
Lawrence	2,912,743	5,017,918	2,665,362	4,407,352
Lebanon	1,669,667	2,816,853	1,294,165	2,283,741
Lehigh, Northampton	7,257,026	9,470,565	6,921,657	9,467,198
Luzerne	195,248	310,969	149,407	234,993
Mercer	14,211	49,971	17,264	59,702
Montgomery	4,006,352	7,129,105	3,959,509	6,757,063
Northumberland	43,880	77,159	42,334	73,884
Philadelphia	11,350	28,815		
Union	278,933	461,463	333,675	538,017
Wayne	199,124	357,299	99,948	191,048
Westmoreland	567,955	1,023,678	(1)	(1)
Wyoming	2,161	50,400	(1)	(1)
Undistributed [2]	[3] 4,988,952	[3] 8,897,549	4,458,727	7,529,309
Total	42,136,289	74,167,870	41,834,265	71,343,906

[1] Figure withheld to avoid disclosing individual company confidential data.
[2] Includes Allegheny, Bedford, Clarion, Clinton, Delaware, Fulton, Lycoming, Montour, Perry, Potter, Susquehanna, Tioga (1960), and Washington Counties, and counties indicated by footnote 1.
[3] Revised figure.

The Atlantic Refining Co. Philadelphia refinery recovered hydrogen sulfide by the Girdler process and burned it to sulfur dioxide for use in making sulfuric acid at the local plant.

Output of byproduct sulfuric acid (100 percent H_2SO_4) at zinc smelters and zinc roasters was slightly higher than in 1960.

Talc.—Output of pyrophyllite (sericite schist) decreased, although sales of sericite schist were greater due to an increase in demand for this material as a filler in asphaltic compounds and joint cement. Production was supplemented with ground material from stock accumulations. The sericite schist was produced at two locations in Adams County and at one location in Cumberland County. The material was processed at a mill in Aspers, Adams County.

Tripoli.—The output of tripoli (rottenstone) was slightly higher. The crude material was ground at two plants in Lycoming County and was marketed principally as a buffing compound and as a filler.

Vermiculite (Exfoliated).—Crude vermiculite from Western States and foreign countries continued to be exfoliated at plants in Bucks and Lawrence Counties. The exfoliated vermiculite was marketed for sundry uses, including insulation, refractories, concrete aggregate, plaster aggregate, and insulation cement.

METALS

Beryllium.—The Beryllium Corp., with operations in Reading and Hazleton, was one of two companies in the United States that processed beryl to beryllium metal, alloys, and compounds. Most of the output was beryllium metal and beryllium-copper alloys.

Cadmium.—Cadmium continued to be recovered from flue dust collected at the St. Joseph Lead Co. Josephtown plant and the New Jersey Zinc Co. Palmerton smelter.

Cobalt.—Output of cobalt as a byproduct of iron ore mining was less than in 1960.

Copper.—Production of copper was higher than in 1960. The copper was recovered in a concentrate produced at the Lebanon concentrator and shipped to a smelter in New York.

Ferroalloys.—Production and shipments of ferroalloys were less than in 1960. Shipments totaled 439,360 short tons valued at $100,343,871. Ferromanganese and spiegeleisen were the leading types of ferroalloys marketed. In addition, smaller quantities of ferrotungsten, chromium-manganese-tungsten, aluminum-vanadium, ferrovanadium, ferroboron, ferrocolumbium, nickel-columbium, ferromolybdenum, molybdenum-aluminum, and aluminum-chromium-vanadium were shipped.

Gold and Silver.—Output of gold and silver decreased. Both metals were recovered from a copper concentrate produced at the Lebanon concentrator of Bethlehem Steel Co., near Lebanon.

Iron Ore.—Shipments of usable iron ore increased. Magnetite produced at the Cornwall and Grace underground mines was shipped to the Lebanon and Morgantown concentrators, respectively, for processing. Shipments from these plants consisted of concentrates and agglomerates for use in producing pig iron and sinter. Pelletizing plants were completed at Lebanon in 1950 and at Morgantown in 1961. Construction of a new concentrating plant at the Cornwall mine, continued.

Iron and Steel Scrap.—Consumption of ferrous scrap totaled 12,483,000 short tons, an 8-percent drop from that of 1960. Ferrous scrap was collected and prepared chiefly in the larger metropolitan areas such as Harrisburg, Philadelphia, and Pittsburgh. The leading varieties of scrap processed and shipped were No. 1 heavy melting steel, No. 2 and all other bundles, cast-iron scrap and other borings, and No. 1 and electric furnace bundles. Stocks of ferrous scrap held by all consumers at yearend totaled 1,846,000 tons.

Pig Iron.—Pig iron output totaled 15.2 million short tons, about 1 million tons less than in 1960. The pig iron was produced by 12 companies at 20 plants having a total of 72 stacks. Foundry, basic, bessemer, low-phosphorus, malleable, and direct-casting types of pig iron were produced.

More basic and bessemer pig iron was produced than any other classes; basic represented 89 percent of the total (13.5 million short tons) and bessemer represented 7 percent (966,000 tons). In the blast furnaces, raw material consumption totaled 5.6 million tons of domestic iron ore, 2.9 million tons of foreign iron ore, 3.2 million tons of limestone and dolomite, 728,000 tons of mill cinder and roll scale,

22,000 tons of flue dust, 1.1 million tons of open-hearth bessemer slag, 10.6 million tons of coke, 61,000 tons of pig iron, 888,000 tons of home and purchased scrap, and 209,000 tons of slag scrap. In addition, manganiferous ore, coke breeze, anthracite, sinter, self-fluxing agglomerates, pellets, and foreign agglomerates were consumed in making pig iron. A total of 3.8 million tons of domestic iron ore, 5.3 million tons of foreign iron ore, 326,000 tons of mill cinder and roll scale, 992,000 tons of flue dust, and 145,000 tons of anthracite and quantities of foreign manganiferous ore, limestone, dolomite, and coke breeze were consumed in agglomerating plants in Pennsylvania to produce sinter and self-fluxing agglomerates.

Smelters.—The Palmerton and Josephtown smelters were active. The Palmerton plant of The New Jersey Zinc Co. processed concentrate from company operations at Friedensville, Pa.; Austinville, Va.; Jefferson City and Treadway, Tenn.; Canyon City, Colo., and other domestic and foreign sources. Both zinc and lead were produced, with zinc the primary product of the smelter. Three Waelz kilns for treating crude ore and byproduct materials resumed operation after 2½ years of idleness. Progress was made on the installation of electric furnaces for the production of spiegeleisen. The Josephtown plant of St. Joseph Lead Co. processed zinc concentrate received from company operations at Edwards and Balmat, N.Y., and at Indian Creek and Leadwood, Mo., as well as material from other States and foreign countries. The furnace stack was relined during the summer months. The zinc content of metal produced at the smelter was 141,209 tons, compared with 146,732 tons in 1960. In December, work began on a new and larger furnace to replace two smaller, less efficient furnaces.

Zinc.—Production of zinc concentrate increased 70 percent partly because of improved demand for zinc products in the second half of the year and partly because of strikes in 1960 during which no production was obtained. The ore produced at the Friedensville mine was concentrated at a nearby plant, and the concentrate was shipped to the Palmerton smelter for processing. Mine drainage problems continued to persist, but adequate pumping capacity permitted continuation of ore extraction at various mine levels. Some new stoping areas were being developed, but poor ground conditions retarded the progress.

REVIEW BY COUNTIES

Adams.—Total stone output was 8 percent less than in 1960. Limestone, chiefly for use as blast-furnace flux, concrete aggregate, roadstone, agricultural stone, and stone sand, was mined and crushed at a quarry and plant west of Hanover, by Bethlehem Limestone Co., a subsidiary of Bethlehem Steel Co. Teeter Stone, Inc., a subsidiary of Harry T. Campbell Sons Corp., Gettysburg, quarried and crushed limestone for concrete aggregate and roadstone. Quantities of roadstone were sold under contract to nearby State Government projects. The Funkhouser Mills, Division of the Ruberoid Co., continued to operate the Charmian quarry (basalt) east of Charmian and the nearby Greystone quarry (quartzite). The stone was crushed and ground for use as roofing granules, tennis court surfacing, and asphalt filler.

TABLE 12.—Value of mineral production in Pennsylvania [1 2 3]

County	1960	1961	Minerals produced in 1961 in order of value
Adams	(4)	(4)	Stone, sericite schist, clays.
Allegheny	(4)	(4)	Cement, coal, clays, sand and gravel, stone.
Armstrong	(4)	(4)	Coal, sand and gravel, clays, stone, lime.
Beaver	(4)	(4)	Coal, clays, sand and gravel.
Bedford	(4)	$1,684,944	Coal, stone, lime, sand and gravel.
Berks	$13,229,516	23,526,165	Iron ore, cement, stone, clays, coal, cobalt, pyrite, sand and gravel.
Blair	(4)	2,346,205	Stone, lime, coal, clays, sand and gravel.
Bradford	(4)	(4)	Sand and gravel, coal.
Bucks	(4)	(4)	Sand and gravel, stone, clays.
Butler	14,099,030	13,675,837	Coal, cement, lime, stone, sand and gravel, clays.
Cambria	40,686,920	36,582,851	Coal, clays, sand and gravel, stone, iron ore (pigment material).
Cameron	292,965	197,349	Coal.
Carbon	(4)	(4)	Coal, stone, sand and gravel.
Centre	(4)	(4)	Lime, coal, stone, clays.
Chester	(4)	(4)	Stone, lime, clays, graphite, gem stone.
Clarion	(4)	11,623,425	Coal, stone, clays.
Clearfield	27,526,100	27,959,810	Coal, clays.
Clinton	2,343,929	1,836,656	Coal, stone, clays.
Columbia	(4)	(4)	Coal, sand and gravel, clays.
Crawford	164,174	122,527	Sand and gravel.
Cumberland	(4)	(4)	Stone, sand and gravel, clays, sericite schist.
Dauphin	3,918,994	3,690,751	Stone, coal, clays, sand and gravel, lime.
Delaware	(4)	(4)	Stone.
Elk	1,243,645	1,407,929	Coal, clays, sand and gravel.
Erie	(4)	(4)	Sand and gravel, peat.
Fayette	(4)	(4)	Coal, stone, clays, sand and gravel.
Forest	(4)	(4)	Sand and gravel.
Franklin	(4)	(4)	Stone, sand and gravel, lime.
Fulton	(4)	(4)	Do.
Greene	63,349,280	60,582,351	Coal, clays.
Huntingdon	4,834,112	3,796,577	Sand and gravel, coal, stone, clays.
Indiana	(4)	23,177,337	Coal, clays.
Jefferson	(4)	(4)	Coal, clays, sand and gravel.
Juniata	(4)	(4)	Stone.
Lackawanna	(4)	(4)	Coal, sand and gravel, stone.
Lancaster	(4)	(4)	Stone, coal, sand and gravel, clays, lime, gem stone.
Lawrence	(4)	(4)	Cement, stone, coal, clays, sand and gravel, peat.
Lebanon	16,272,894	(4)	Iron ore, lime, copper, stone, cobalt, pyrite, coal, gold, silver, gem stone.
Lehigh	(4)	(4)	Cement, zinc, stone, gem stone.
Luzerne	(4)	(4)	Coal, sand and gravel, stone, peat, clays.
Lycoming	1,489,284	1,759,556	Stone, sand and gravel, coal, tripoli.
McKean	439,400	371,979	Clays, sand and gravel, coal.
Mercer	3,156,941	3,958,718	Coal, sand and gravel, stone.
Mifflin	(4)	(4)	Stone, sand and gravel, lime.
Monroe	(4)	(4)	Stone, clays, sand and gravel.
Montgomery	14,071,756	12,645,092	Stone, cement, lime, clays, sand and gravel, gem stone.
Montour	(4)	(4)	Stone, sand and gravel.
Northampton	(4)	(4)	Cement, stone, sand and gravel, coal.
Northumberland	(4)	(4)	Coal, clays, stone, sand and gravel, lime.
Perry	(4)	(4)	Stone.
Philadelphia	(4)	(4)	Sand and gravel.
Potter	(4)	(4)	Stone.
Schuylkill	54,881,224	55,035,930	Coal, stone, sand and gravel, clays, gem stone.
Snyder	614,357	509,860	Clays, stone, coal, sand and gravel, lime.
Somerset	(4)	(4)	Coal, clays, stone, sand and gravel.
Sullivan	97,845	90,334	Coal.
Susquehanna	(4)	(4)	Stone, coal.
Tioga	(4)	1,340,683	Coal.
Union	461,463	538,017	Stone.
Venango	(4)	2,222,660	Coal, sand and gravel.
Warren	(4)	(4)	Sand and gravel.
Washington	(4)	(4)	Coal, stone, clays.
Wayne	(4)	340,653	Stone, peat, coal, sand and gravel.
Westmoreland	19,823,493	(4)	Coal, stone.
Wyoming	(4)	(4)	Sand and gravel, stone.
York	13,814,831	14,591,689	Cement, stone, lime, sand and gravel, clays, mica.
Undistributed	[5] 526,547,379	486,031,882	
Total	[5] 823,360,000	791,648,000	

[1] Pike County is not listed because no production was reported.
[2] Excludes value of production for LP gases, natural gasoline, petroleum, natural gas, and some gem stone and sand and gravel unspecified by counties; included with "Undistributed."
[3] Excludes value of clays and stone used in manufacturing lime and cement.
[4] Included with "Undistributed" to avoid disclosing individual company confidential data.
[5] Revised figure.

Summit Industries, Inc., operated two open-pit mines near Mount Hope and Bendersville to produce sericite schist. The crude material was trucked to the company plant at Aspers to be crushed, screened, and ground, chiefly for use as a filler in asphaltic compounds and joint cement. Mauna Mining Corp. had spent the last 2 years in development of an open-pit mine near Idaville to produce sericite schist. Production was expected to begin in 1962. The Liberty Stone Co. soapstone operation near Fairfield was inactive during the year.

Miscellaneous clay production remained virtually the same as in 1960. Alwine Brick Co., New Oxford, and Gettysburg Drain Tile Works, Gettysburg, mined miscellaneous clay from open pits and used the clay for making building brick and drain tile, respectively.

Allegheny.—Cement shipments continued to decline. Greenbag Cement Co., Division of Marquette Cement Manufacturing Co., at its Neville Island plant, manufactured mostly slag portland cement and some masonry cement by the wet process. Universal Atlas Cement, Division of United States Steel Corp., manufactured portland and masonry cements using the dry process at the company plant at Universal. Major shipments were by truck, mostly intrastate and to West Virginia and Ohio.

Both underground and strip mines were operated to produce bituminous coal. About 90 percent of the output was from underground mines. Twenty-one underground mines were active—four less than in 1960 and eight less than in 1959. A total of 38 cutting machines cut 4.3 million tons of coal, and about the same quantity of coal was mechanically loaded by 89 loading machines. Of the mechanically cleaned coal, 29 percent was washed, using jigs. Twenty-three strip mines, one more than 1960, produced coal, using 38 power shovels and 6 draglines. Most of the draglines and shovels had a capacity of less than 3 cubic yards.

Production of miscellaneous clay, continuing the decline which began in 1958, was 60 percent below the previous high of 1957. Four companies mined clay for their own use in the manufacture of building brick. Milliken Brick Co., Inc., the largest clay producer, mined clay from pits near Pitcairn and Wilkinsburg. Smaller quantities of miscellaneous clay were recovered near Bridgeville, Creighton, and McKeesport.

Despite labor strikes in the construction industry in western Pennsylvania and adverse weather conditions in the early part of the year, output of sand and gravel rose to its greatest height since 1956. Output from four producers totaled 205,000 tons and represented a 69-percent increase over that of 1960. Materials processed were used for construction and industrial purposes.

Nick Gioia, Buena Vista, produced dimension sandstone as rubble. Malli Mines produced dimension sandstone as irregular-shaped building stone and as flagging stone from a quarry in Jefferson Borough. Perlite, obtained from mines in Utah and New Mexico, was expanded by Panacalite Perlite Co., Pittsburgh, and Perlite Manufacturing Co., Carnegie. The material was sold or used for building plaster aggregate.

Armstrong.—Forty-five underground bituminous coal mines, 46 strip mines, and 11 auger mines were active. This was a decrease of nine

underground mines and an increase of seven strip mines and one auger mine. Slightly more coal was produced from underground mines than from strip mines. Of underground production, 99 percent was mechanically loaded, using 42 loading machines. Pneumatic, other washing methods, and jigs, in decreasing order, were used for cleaning the coal. Sixty-six power shovels and 21 draglines were operated; 55 of the power shovels had a capacity of less than 3 yards, 10, a capacity of 3 to 5 yards.

Armstrong County continued as the second-ranking sand and gravel producing county and was the center of the industry in southwestern Pennsylvania. The output, from four plants, was used primarily as structural and paving material; a small quantity of the sand and gravel produced was shipped to consumers as unprepared material.

Although the quantity and value of clay production declined, the county ranked fourth in tonnage and second in value of clay output. Six underground mines, one each at Adrian, Freeport, Templeton, and New Bethlehem and two at Kittanning, supplied clay used to produce firebrick and block and heavy clay products. Clays obtained from open-pit operations at Apollo, Craigsville, and Worthington were used in manufacturing heavy clay products.

Two producers, both near Kittanning, quarried and crushed limestone solely for use in making lime. Beaver Run Limestone Co., Apollo, produced crushed and broken limestone for use as concrete aggregate and roadstone. Three operators near Kittanning produced hydrated lime and sold it for agricultural purposes. Walter Hershberger discontinued lime operations during the year.

Beaver.—Underground, strip, and auger mines produced bituminous coal; the largest production came from 13 strip mines using 18 power shovels and 9 draglines. At the underground mines, two cutting machines and two mechanical loading machines were used; all of the underground production was mechanically loaded. Jigs and other mechanical wet washing methods were used to clean the coal.

Clay output declined substantially from that of 1960, and was well below the quantity reported in 1956 when Beaver County ranked first in production of clays. Three of four underground mines were active during the year and supplied 68 percent of the clay produced. Eight open pits were nonproductive during the year; six of these were closed, and temporary shutdowns were reported for pits operated by Kaiser Refractories and Chemicals Division of Kaiser Aluminum and Chemical Corp. and McQuiston Coal Co.

Combined output of sand and gravel reported by three producers was substantially lower than in 1960; however, Beaver County was the fifth largest sand and gravel producing county. Building and paving sand and gravel was processed and shipped to consumers by waterway and truck. Central Commercial Co. made artificially colored roofing granules at Darlington, using shale as raw material.

Bedford.—Twenty-one underground mines and two strip mines produced bituminous coal. Of the undergound production, 46 percent was mechanically loaded; none was mechanically cleaned. At the strip mines, four power shovels, three draglines, and three bulldozers were used.

Stone output increased 29 percent over that of 1960. Three companies produced limestone at quarries near Everett, New Paris, and Hyndman, chiefly for use as agricultural stone, concrete aggregate, roadstone, and for the manufacture of lime. Leap Ganister Rock Co. produced ganister rock at its No. 1 quarry near Madley. The stone was crushed and sized at a local plant for use as furnace or converter linings.

J. Mason Kerr, Hyndman, produced and sold quicklime, using a one-pot kiln at its Hyndman plant. New Enterprise Stone & Lime Co. produced and sold hydrated lime for agricultural purposes at its Ashcom plant near Everett. Feight Bros. recovered sand from a pit near Everett and processed it at an adjacent plant for use as building material.

Berks.—Bethlehem Cornwall Corp., a subsidiary of Bethlehem Steel Co., continued operating its Grace undergound mine near Morgantown, producing crude magnetite ore mainly by block caving. The crude ore was processed at the local company plant using flotation and magnetic concentration.

Shipments and value of portland cement increased 12 and 10 percent, respectively. Allentown Portland Cement Co. produced portland and masonry cements at its No. 1 five-kiln plant in Evansville. Finished cement was shipped mostly by railroad to consumers in Pennsylvania, New Jersey, Connecticut, and New York.

A total of 2,672,000 tons of stone was produced, a 4-percent increase over the 1960 figure. Four companies quarried and crushed limestone at six operations—two near Evansville and one each near Kutztown, South Temple, Sinking Spring, and Oley. The stone was sold or used directly as concrete aggregate and roadstone and in the manufacture of cement. Quantities of the roadstone were sold under contract for use at nearby State Government projects. Eighty-four percent of the output was shipped by truck. Reading Poultry Food Co., Reading, crushed oystershell for use as poultry grit. Basalt, produced by John T. Dyer Quarry Co. at the Clingan quarry, Birdsboro, was crushed and sized at a local plant for railroad ballast and roadstone. Diabase was quarried chiefly for roadstone, near Douglassville and Morgantown. Sandstone from a quarry near Bechtelsville was crushed and sold for use as concrete aggregate and roadstone.

Glen-Gery Shale Brick Corp. produced miscellaneous clay from open pits near Wyomissing and Shoemakersville for use in the manufacture of building brick.

A small quantity of anthracite was recovered by river dredging.

Two producers operated fixed plants, one near Sinking Spring and the other near Temple, to produce sand and gravel for building and paving use. Gem-quality pink and green feldspar, magnetite, zircon, and epidote were collected near Lobachsville and west of Boyertown, primarily as a hobby.

Blair.—Production and value of stone was slightly higher than in 1960. Crushed limestone was produced by six companies operating seven quarries near Roaring Spring, Hollidaysburg (3), Altoona, Claysburg, and Duncansville. Output was sold or used directly for roadstone and agricultural purposes. The leading producer was New Enterprise Stone & Lime Co. Quartzite was quarried and crushed for

use in making silica brick by General Refractories Co., Frankstown, and J. L. Hartman, Sproul. Basalt Trap Rock Co., Williamsburg, quarried and crushed quartzite chiefly for railroad ballast and road material. West Virginia Pulp & Paper Co., a new lime producer in the county, produced quicklime at its plants at Tyrone and Williamsburg and used the lime for manufacturing paper.

Two underground bituminous coal mines and one strip mine were operated. The largest part of the coal came from the strip mine, at which two power shovels and one dragline were operated.

Blair County was one of two counties producing kaolin. Kaolin, mined near Williamsburg, was used to manufacture refractories. A small quantity of plastic fire clay was mined at an open pit near Martinsburg. Two plants near Hollidaysburg processed sand for construction use.

Bradford.—J. A. Eck & Sons, Inc., and Towanda Sand & Gravel Corp. produced building and paving sand and gravel from pits near Towanda. One strip mine was operated for the production of bituminous coal.

Bucks.—Output of sand and gravel declined for the second consecutive year; it was 3 percent below that of 1960 but Bucks County remained the leading county in both tonnage and value of production. Sand and gravel was processed primarily for use as building and paving material; a small quantity of molding sand was produced near Tullytown. The Sand & Gravel Division of Warner Co., Tullytown, was the principal producer in the State. Sand and gravel was transported to consumers by truck, waterway, and railroad.

Five quarries near Rushland, Eureka, New Hope, Langhorn, and Buckingham, produced limestone solely for use as concrete aggregate and roadstone. Some dimension limestone for use as rough construction stone was quarried near Langhorn. Coopersburg Granite Co., east of Coopersburg, quarried dimension black diabase for dressed architectural and monumental stone. Edison Quarry, Edison, quarried dimension diabase for use as rough and dressed construction stone and also crushed quantities of the diabase for use as road material. Four operators near Weisel, Telford, Quakertown, and Ottsville, quarried and crushed diabase principally for concrete aggregate and roadstone and a small quantity for railroad ballast. Samuel M. Yoder Estate operated the Blooming Glen quarry and crushing plant, producing bluestone and redstone, and George Wiley operated the Wiley's quarry near Point Pleasant, producing bluestone. Both companies quarried and crushed sandstone for use as concrete aggregate and roadstone. Delaware Quarries, Lumberville, produced and sold dimension sandstone as irregular-shaped construction stone.

Quakertown Brick & Tile Co., Inc., recovered shale from an open pit near Quakertown and used the material to manufacture building brick.

Vermiculite imported from the Union of South Africa was processed by Hyzer & Lewellen at the company's Southampton plant. The material was used directly or marketed primarily as concrete and plaster aggregate and residential insulation products.

Butler.—Bituminous coal was produced from 22 underground mines, 41 strip mines, and 6 auger mines. This was 2 less underground

mines, 4 more strip mines, and 1 more auger mine than were active in 1960. Thirty-seven cutting machines and 15 loading machines, 1 each less than in 1960, were used at the underground mines; 74 percent of the underground production was mechanically loaded. Sixty-seven power shovels and 35 draglines, 1 carryall, and 58 bulldozers were used at the strip mines. Sixty of the power shovels and 10 of the draglines had a capacity of less than 3 cubic yards, while 7 power shovels and 12 draglines had a capacity of 3 to 5 cubic yards. About 25 percent of the coal was mechanically cleaned, principally by jigs.

Penn-Dixie Cement Corp. used captive crushed limestone for manufacturing Types I-II and III portland cement and some masonry cement, using the wet process, at its No. 9 plant, West Winfield. Finished cement was shipped mostly by truck, in bulk, to ready-mixed concrete companies, intrastate.

Mercer Lime & Stone Co. produced quicklime and hydrated lime at its plant one-half mile west of Branchton. Quicklime and hydrated lime was marketed for chemical and industrial uses, and some hydrated lime was sold for agricultural purposes. Output of limestone continued to decline, although five companies, one more than in 1960, operated quarries near Harrisville, Portersville, West Winfield (2), and Branchton. The crushed limestone was used for concrete aggregate, roadstone, cement manufacture, and agricultural purposes.

Construction sand and gravel was prepared at plants near Slippery Rock. Shale recovered by Scott Borland Brick Yard from an open pit near Mars was used in the manufacture of building brick.

Cambria.—Bituminous coal was produced from 87 underground mines, 21 strip mines, and 1 auger mine. This was 1 less underground mine, 2 less strip mines, and 3 less auger mines than were worked in 1960. Ninety-three percent of the production came from underground mines. One hundred and eleven cutting machines, 31 less than in 1960, and 144 loading machines, 38 less than in 1960, were used at the underground operations; 97 percent of the underground production was mechanically loaded. Forty-one power shovels, 13 draglines, and 27 bulldozers were used at the strip mines. Approximately 81 percent of the coal was mechanically cleaned using pneumatic and other wet washing methods.

Clays mined from two underground operations at Patton and South Fork and two open pits at Johnstown and Hastings declined 16 percent from that of 1960. Fire clay was used for building brick, vitrified sewer pipe, and refractories. Parry Sand & Gravel Co., Johnstown, processed sand and gravel for construction use. Sandstone, crushed and broken for use in making silica brick and as road material, was quarried near Johnstown. Crude iron oxide pigments of the sulfur-mud variety were produced at the No. 31 mine near Twin Rocks for use in making paint pigments.

Cameron.—The entire production of bituminous coal came from one strip mine. Three power shovels, one dragline, and three bulldozers were used at this mine.

Carbon.—Anthracite from underground mines, strip pits, culm banks, and river dredging decreased 17 percent from the 1960 output. More than 83 percent of the production was shipped by rail. The

principal producers of anthracite were Sullivan Trail Co., Greenwood Stripping Co., Honeybrook Mines, and Admiral Coal Co.

North American Refractories recovered quartzite at the Little Gap quarry and crushed the stone at the Palmerton plant for use in making silica brick. James and Paul Fauzio quarried and crushed sandstone at the Red Rock quarry and stationary plant near Nesquehoning and sold the stone for road material. Alliance Sand Co., Inc., a subsidiary of Martin Marietta Corp., operated its pit and plant near Palmerton, producing prepared sand for paving, cement manufacture, and other building uses. Other plants produced smaller quantities of construction sand and gravel.

Centre.—Despite a continued but slight decline in quantity and value of lime, Centre County was again the leading lime-producing county. Three producers operated rotary kilns near Bellefonte. Quicklime and hydrated lime were marketed chiefly for chemical and industrial uses, with smaller quantities for agricultural and construction uses.

Fourteen bituminous coal strip mines and 13 underground mines were active. This was three less strip mines, two less auger mines, and two more underground mines than in 1960. About 95 percent of the coal output came from strip mines using 41 power shovels, 13 draglines, and 14 bulldozers. At the underground operations, five cutting machines and two loading machines were used; 36 percent of the underground production was mechanically loaded. None of the production was mechanically cleaned.

Limestone, the only stone produced increased 4 percent in both tonnage and value; total output was approximately 2 million short tons. The principal uses of the limestone were for concrete aggregate, roadstone, lime manufacture, and open-hearth flux. Six companies produced crushed and broken limestone, principally from quarries near State College, Bellefonte, and Pleasant Gap. Fifty-five percent of the stone produced was shipped by truck; the remainder was shipped by railroad or consumed at the local plants. Harbison-Walker Refractories Co. produced a small quantity of fire clay at the Blair clay pit.

Chester.—Quantity and value of stone decreased 11 percent and 18 percent, respectively, although output continued to exceed 2 million short tons. Bradford Hills Quarry, Inc., crushed limestone near Downingtown for use as road material. Some of the stone was sold to local Government agencies for road construction. The Cedar Hollow quarry and plant at Devault, operated by Warner Co., Bellefonte Division, yielded crushed limestone for use as road material, blast-furnace flux at chemical plants, and agricultural stone and in manufacturing refractories and lime. Quicklime and hydrated lime, chiefly for sewage and trade-waste treatment, agricultural use, and paper manufacture, were produced at the Cedar Hollow plant. The Warner Co. Johnson quarry and plant near Paoli yielded limestone solely for use as concrete aggregate and roadstone. Valley Forge Stone Co. produced and crushed limestone at its quarry and plant near Malvern, solely for use as roadstone.

French Creek Granite Co., Saint Peters, quarried and dressed dimension stone (black diabase) for use as architectural stone, ornamental stone for monuments and mausoleums, and industrial surface plates. Three producers near Delaware, Cornog, and Elizabethville

produced and crushed diabase principally for use as concrete aggregate and roadstone. Abram T. Minor, John Fecondo & Sons, and Albert Rotunno quarried dimension sandstone (bluestone) as irregular-shaped construction stone, flagging stone, and rubble. Dimension sandstone was quarried near Malvern by Bacton Hill Quarry and sold, or used directly, as irregular-shaped construction stone and rubble. Some of the stone was used on the exterior and interior of buildings at the Cherry Hill Shopping Center, Cherry Hill, N.J., and the Dublin Lutheran Church, Dublin, Pa.

Installation of a heavier crusher and improved grinding, screening, and storage facilities enabled McAvoy Vitrified Brick Co. to process a greater quantity of miscellaneous clay and shale for the manufacture of building brick.

Crystaline flake graphite for use in crucibles and foundry facings was produced near Chester Springs by Graphite Corp. of America. Mineral specimens including galena, dewylite, acrocryptite, clinozoisite, kyanitic quartz, and allanite were collected near Phoenixville, West Chester, and Cornog.

Clarion.—Clarion County again ranked second in strip mining of bituminous coal, with 14 percent of the State's strip-mine tonnage. Sixty-seven power shovels, 36 draglines, and 37 bulldozers were used at the 30 active strip mines. Sixty of the 67 power shovels had a capacity of less than 3 cubic yards, and 7 had a capacity of 3 to 5 cubic yards. Eighteen of the 36 draglines had capacities of 3 to 5 cubic yards; 11, 6 to 12 cubic yards; 5, less than 3 cubic yards; and 2, 12 cubic yards. Seven cutting machines and three loading machines were used at the underground mines where 52 percent of the coal was mechanically loaded. Forty-two percent of the coal produced in the county was mechanically cleaned. Of the coal mechanically cleaned, 54 percent was cleaned by use of jigs.

Limestone for use as concrete aggregate and roadstone, and for agricultural purposes was produced by Allegheny Mineral Corp. at a quarry and plant east of Parker. Emlenton Limestone Co. produced limestone at a quarry near Turkey City for use as roadstone.

Clay production decreased considerably from the 1960 figure, and was the least since 1958. Fire clay was produced by Frank Pope Co. and Climax Division of A. P. Green Fire Brick Co. from underground mines near New Bethlehem and north of Climax, respectively. Stahlman Coal Co. announced that it had abandoned its Bish clay pit, but it did recover fire clay from the Horlung property near Corsica, Pa. New Bethlehem Tile Co. mined both fire clay and miscellaneous clay from a property near New Bethlehem. Fire clay was used in manufacturing firebrick and block, mortar, building brick, and other heavy clay products; miscellaneous clay was used to make tile and building brick.

Clearfield.—Clearfield County continued to lead in the production of bituminous coal from strip mines. One hundred and one strip mines were active, five less than in 1960. A total of 214 power shovels, 90 draglines, 164 bulldozers, 32 horizontal power drills, and 30 vertical power drills were used at the strip operations. Of the power shovels, 199 had a capacity of less than 3 cubic yards; 14, 3 to 5 cubic yards; and 1, 6 to 12 cubic yards. Of the draglines, 29 had a capacity of

less than 3 cubic yards; 33, 3 to 5 cubic yards; 23, 6 to 12 cubic yards; and 5, over 12 cubic yards. Seventy-two underground mines, 10 less than in 1960, were operated for the production of bituminous coal. A total of 99 cutting machines and 51 loading machines were used. Of the coal mined underground, 1.2 million tons was cut mechanically, and 895,000 tons was loaded mechanically. A total of 600,000 tons of coal was wet-washed, and 655,000 tons was cleaned using pneumatic methods. This represented only 19 percent of the coal production being mechanically cleaned.

Production of clays was 23 percent less than in 1960 and was only 3 percent higher than the low recorded in 1958. Despite the decline, Clearfield remained a leading clay-producing county. Eighteen companies reported clay-mining activities. Fifteen produced only fire clay; two produced both fire clay and miscellaneous clay; the other produced only miscellaneous clay. A total of 32 mining operations were reported; 5 were underground, and 27 were open-pit mines. Seven companies sold their entire production of fire clay to manufacturers of refractory products. Fire clays produced were used primarily for firebrick and block and other refractories; a small quantity was used to produce building brick and vitrified sewer pipe. Output of miscellaneous clay and shale was consumed in the manufacture of vitrified sewer pipe and building brick.

Sand and gravel facilities operated by Clearfield Limestone Corp. were purchased late in October by Fry Coal & Stone Co. The plant remained inactive for the balance of the year.

Clinton.—Bituminous coal was mined from three underground mines and five strip mines, one less underground mine than in 1960. At the strip mines, 13 power shovels, 7 draglines, and 11 bulldozers were used. None of the coal mined underground was mechanically cut or mechanically loaded. Of the total coal output, 47 percent was mechanically cleaned.

Lycoming Silica Sand Co., Salona, crushed and sized limestone for use as concrete aggregate, roadstone, and railroad ballast. Some roadstone was sold to the Pennsylvania Department of Highways.

Miscellaneous clay mined under contract for Mill Hall Clay Products, Inc., Castanea, was used for manufacturing heavy clay products. Union Mining, Inc., used fire clay produced at Avis for the manufacture of high-alumina brick.

Columbia.—Anthracite mined from strip pits, culm banks, river dredging, and underground mines totaled 480,200 tons. Leading producers were Jeddo-Highland Coal Co., Sanchez Construction Co., Reading Anthracite, and Lone Star Coal Co.

Bloomsburg Sand & Gravel Co. produced sand and gravel for use as building material from a pit and fixed plant near Bloomsburg.

Alliance Clay Products Co. recovered miscellaneous clay from property leased from Lloyd E. Eister, Mifflinville. Output was used to produce heavy clay products.

Crawford.—Sand and gravel produced by four operators was sold for use as structural and paving sand and gravel and gravel for fill.

Cumberland.—Locust Point Stone Quarries, Mechanicsburg, produced roadstone and agricultural limestone. Hempt Bros., Inc., Camp

Hill, and Valley Quarries, Inc., Shippensburg, produced crushed limestone for use as road material.

Output of sand and gravel was 17 percent less than in 1960. Sand and gravel was processed at three plants and sold for building and road paving uses.

Cumberland County continued as the leading source of kaolin in the State. Kaolin produced by Philadelphia Clay Co. from an open pit near Mt. Holly Springs was used in the manufacture of white cement. The Penn Products Corp. Black Clay mine was inactive the entire year.

Summit Industries, Inc., produced sericite schist at the Herman mine near Goodyear. The crude material was shipped to the company plant at Aspers, Adams County, for processing.

Dauphin.—Total output of stone was 1,478,000 short tons, a slight increase over that of 1960. Four companies crushed limestone at plants near Steelton, High Spire, Harrisburg, and northwest of Palmyra. Chief uses of the stone were for concrete aggregate, roadstone, and blast-furnace flux. Some of the stone was sold to nearby Government agencies for road construction.

A total of 135,400 tons of anthracite was produced from strip mines, culm banks, underground mines, and river dredging.

Shale produced by Glen-Gery Shale Brick Corp.'s Harrisburg and Middletown Divisions was used for the manufacture of building brick. Miscellaneous clay produced by Bethlehem Limestone Co. at its Steelton quarry was used for making protective covering for pipelines.

Output of sand and grave decreased 23 percent mainly because of the liquidation and dismantling of the Highspire Sand & Gravel Co. Hill Station plant near High Spire. Hydrated lime was produced at the Swatara plant, Annville, by H. E. Millard Lime & Stone Co. and sold for agricultural use.

Delaware.—V. DiFrancesco & Sons, Havertown, and General Crushed Stone Co., Glen Mills, quarried and crushed granite (gneiss) chiefly for use as concrete aggregate and roadstone. Dimension granite was recovered at two quarries near Lima and Swarthmore, solely for use as irregular-shaped construction stone. Media Quarry Co., Media, quarried dimension sandstone for rough construction and rubble.

Perlite Products Corp. expanded perlite at its Primos plant from crude material obtained from Colorado. The expanded material was sold or used chiefly as building plaster aggregate, as a mix with asphalt for insulating material, and as concrete aggregate.

Sinclair Refining Co. produced liquid sulfur as a byproduct in the liquid purification of oil refiinery gas by the Claus-type process at its Marcus Hook refinery. Sun Oil Co. produced sulfur as a byproduct from the single stage catalytic oxidation of hydrogen sulphide.

Elk.—Bituminous coal was produced at 15 underground mines (16 in 1960), 8 strip mines (10 in 1960), and 1 auger mine. Most of the coal was produced from the strip mines. At the strip mines, 15 power shovels, 5 draglines, and 12 bulldozers were used. Of the coal mined underground, 81 percent was mechanically loaded using 19 loading machines. Only a small percent of the county production was mechanically cleaned, using wet washing methods.

Fire clay produced was used to manufacture firebrick and block and vitrified sewer pipe. Stone Haven Mix, operating a portable plant near Johnsonburg, produced paving gravel for use on roads by local and State highway crews. Speer Carbon Co., Inc., Saint Marys, produced manufactured (artificial) graphite and sold it to steel manufacturers, iron and steel foundries, and the electrochemical industry.

Erie.—The combined output of sand and gravel by four companies increased slightly over that of 1960. Processed material was transported to consumers by rail and truck. Reed-sedge and humus peat recovered from a bog near Corry by Corry Peat Products Co., was sold packaged and in bulk.

Fayette.—Twenty-seven underground mines, 10 less than 1960, 21 strip mines, 9 less than in 1960, and 1 auger mine were operated for the production of bituminous coal. At the underground mines, 13 cutting machines and 10 loading machines were used. Twenty-one power shovels, 5 draglines, and 22 bulldozers were used at the strip mines. Coal was mechanically cleaned using both jigs and pneumatic methods.

Fry Coal & Stone Co., Division of Martin Marietta Corp., ground and sized limestone from the Lake Lynn quarry, Lake Lynn, and the Coolspring quarry, Uniontown. The stone was sold for use as concrete aggregate, roadstone, and dust for coal mines and for agricultural purposes. General Refractories Co. produced crushed and ground ganister rock at the Childs Nos. 1 and 2 mines for making silica brick. Connellsville Blue Stone Co. quarried and crushed sandstone (bluestone) near Connellsville, for use as concrete aggregate and roadstone. Dimension sandstone sold or used as rubble for dry wall construction was quarried near Connellsville.

Clay from four open pits—one less than in 1960—totaled 98,000 tons and was 34 percent below the 1960 production. Layton Fire Clay Co. mined miscellaneous clay near Layton. Harbison-Walker Refractories Co. and Kaiser Refractories and Chemicals Division, Kaiser Aluminum and Chemical Corp. both near Ohiopyle, and Robert N. Matthews, Lemont Furnace, mined fire clay for the manufacture of refractories. McClain Sand Co., Inc., shipped prepared sand and gravel by truck, railroad, and waterway. Part of the prepared gravel was used by the Pennsylvania Department of Highways.

Forest.—Tionesta Sand & Gravel, Inc., Tionesta, processed sand and gravel for construction uses.

Franklin.—Six active producers mined limestone from seven quarries near Shippensburg, Williamson, Dry Run, Chambersburg, and Mercersburg. The limestone was used chiefly for concrete aggregate and roadstone. Smaller quantities were sold for use as railroad ballast and for agricultural purposes.

Two companies processed sand for building use. Output increased 13 percent over that of 1960. Quicklime, sold for agricultural purposes, was produced in a coal-fired three-shaft-kiln plant at Mercersburg by Frank L. Heinbaugh.

Fulton.—H. B. Mellot Estate, Inc., produced limestone at the Morton quarry, Big Cove Tannery, and the Charlton quarry, Warfordsburg. The stone was crushed at local plants chiefly for use as concrete ag-

gregate and roadstone; some was used for agricultural purposes. Russell Martz produced crushed limestone at the Martz Draw Kiln near Hustontown, for use in lime manufacture. Quicklime was marketed for agricultural use.

H. B. Mellot Estate, Inc., also produced sand; production dropped sharply in 1961, because of the completion of a large construction project in 1960.

Greene.—Greene continued to be the leading county in output of bituminous coal from underground mines; production totaled 9.5 million tons, compared with 10 million in 1960. Eighteen underground mines were active, one less than in 1960. All but a small fraction of the underground production was cut by 39 cutting machines and loaded mechanically by 149 machines. In addition to the underground mines, four strip mines were active, three more than in 1960. Seventy-two percent of the county production was mechanically cleaned, using wet washing methods.

Greene County Clay Products Co., Inc., mined a small quantity of shale from a bank deposit near Waynesburg for use in the manufacture of building brick.

Huntingdon.—Huntingdon County continued to be the chief source of specialized industrial sands. In addition to blast, molding, and engine sands, a variety of ground sands and sands for other industrial uses was prepared by Pennsylvania Glass Sand Corp. at its Keystone Works near Mapleton Depot.

Bituminous coal was produced at four underground mines and five strip mines. Approximately half of the underground tonnage was cut by machine; none was mechanically loaded. None of the output from the underground mines or the strip mines was mechanically cleaned.

Limestone recovered from the McConnellstown quarry of New Enterprise Stone & Lime Co. was crushed for use as concrete aggregate and roadstone. Warner Co., Bellefonte Division, Union Furnace, quarried and crushed limestone as concrete aggregate, roadstone, railroad ballast, and riprap. North American Refractories produced and crushed ganister rock at its Three Springs quarry and plant for making silica brick. Harbison-Walker Refractories Co. did not operate its Mount Union Quarry during the year. Alexandria Fire Clay Co. sold plastic clay from stock as refractory mortar.

Indiana.—Bituminous coal was produced from 72 underground mines, 2 less than in 1960, 29 strip mines, 1 more than in 1960, and 4 auger mines, the same number as in 1960. At the underground mines, 89 cutting machines and 102 loading machines were used. Approximately 96 percent of the underground production was mechanically loaded, and virtually all underground production was mechanically cut. Fifty-one power shovels, 16 draglines, and 57 bulldozers were used at the strip mines. About 66 percent of the county production was mechanically cleaned using jigs, pneumatic, and other wet washing methods.

Hiram Swank's Sons, Inc., discontinued mining operations at its Swank No. 6 underground clay mine. Plastic fire clay produced by L. H. Foehrenbach at a strip mine near Clymer was sold to Hiram Swank's Sons for the manufacture of refractories.

Jefferson.—Bituminous coal was produced from 32 underground mines, 3 more than in 1960, 29 strip mines, 1 less than in 1960, and 5 auger mines, the same number as in 1960. At the underground mines, 50 cutting machines and 30 loading machines were used; 83 percent of the coal was mechanically loaded. At the strip mines, 62 power shovels, 19 draglines, and 50 bulldozers were operated. Only a small quantity of the coal was mechanically cleaned; most of this was cleaned by pneumatic methods.

Fire clay produced from three underground mines—one each at Brookville, Brockway, and Summerville—and from an open pit near Brockway was used to manufacture firebrick and block, vitrified sewer pipe, building brick, tile, and other heavy clay products. Strishock Coal Co. reported no clay production at its pit near Brockway. Bank run gravel recovered by Brockway Sand & Gravel Co., Brockway, was used by local townships and boroughs for maintaining roads.

Juniata.—W. N. Quigley quarried and crushed limestone near Mifflintown for use as concrete aggregate, roadstone, and agricultural stone. Kaiser Aluminum & Chemical Corp. recovered quartzite and crushed and used it at the Van Dyke plant, Thompsontown, to manufacture silica brick.

Lackawanna.—Output of anthracite declined 37 percent in quantity, but the average value per short ton increased from $9.18 in 1960 to $9.89. Anthracite was mined at underground mines, strip pits, and culm banks. Leading producers were Moffat Coal Co. and Hudson Coal Co.

Keystone Pavement & Construction Co., Inc., used part of its output as a prime contractor and sold building and paving sand and gravel to the Pennsylvania Department of Highways and local consumers. Contractors Sand & Gravel, Inc., supplied the Pennsylvania Department of Highways and contractors with building and paving materials. Scranton Sand & Stone Co. produced sand and gravel for paving use. Stabler Construction Co. quarried and crushed sandstone for road material at the West Mountain quarry near Scranton. Most of the stone was sold to the Pennsylvania Department of Highways for road construction.

Lancaster.—The tonnage and value of crushed and broken limestone increased 13 and 14 percent, respectively; output totaled 2,587,000 short tons. Fourteen companies operated 16 quarries, 1 more than 1960, principally near Talmage, Quarryville, Blue Ball, Gap, Denver, and East Petersburg. Leading producers were D. M. Stoltzfus & Son, Inc., Ivan M. Martin, Inc., and Binkley & Ober, Inc. Most of the crushed stone was sold or used for concrete aggregate and roadstone; smaller quantities were used for agricultural purposes, stone sand and asphalt fill. Much of the stone was sold to the Pennsylvania Department of Highways, local and nearby Government agencies, and the Maryland and Delaware State Highway Departments for road construction.

George F. Pettinos, Inc., produced industrial sand at his Honeybrook plant. Ephrata Sand & Gravel Co., Brownstown, Hempt Bros., Elizabethtown, and Milton Grove Sand, Inc., Milton Grove, produced construction sands.

Whitaker Clay Co. produced only a small quantity of fire clay prior to the sale of its property to Narvon Products, Inc., in July. Glen-Gery Shale Brick Corp. produced shale from two mines at Ephrata and Brickerville, and the Lancaster Brick Co. produced miscellaneous clay at Lancaster for its own use in the manufacture of building brick. Quicklime, for agricultural use, was produced and sold by Amos K. Stoltzfus, Elverson. Mineral specimens and gem-quality stones (fluorite, actionolite, byssolite, and pink dolomite) were collected near Blue Ball and Morgantown.

Lawrence.—Shipments and value of portland and masonry cements increased slightly. Bessemer Cement Co., Division of Diamond Alkali Co., utilized crushed captive cement rock at its Bessemer plant to manufacture Types I–II and III, air-entrained and non-air-entrained portland cement. Masonry cement also was produced. Medusa Portland Cement Co., Wampum, produced mostly general use and moderate heat and high-early-strength portland cements and some masonry cement, using the dry process. Cement rock, limestone, sand, shale, slag, and gypsum were used as raw materials. Shipments of cement were largely in bulk by truck to ready-mixed concrete companies and highway contractors in Pennsylvania and Ohio.

Tonnage and value of limestone decreased 9 and 12 percent, respectively, as compared with 1960; total output was 2,665,000 short tons. Five companies produced crushed limestone and cement rock, mainly for use as blast-furnace flux, concrete aggregate, and roadstone, and in manufacturing cement. The stone was recovered from quarries near Bessemer, Wampum, Hillsville, West Pittsburg, and Mahoning Township. Most of the stone was transported by rail.

Bituminous coal was mined from 1 underground mine, 17 strip mines, and 3 auger mines. Twenty-nine power shovels, 21 draglines, and 26 bulldozers were used at the strip mines. Coal mined underground was mechanically loaded and mechanically cut; however, none of the production from the underground mines, strip mines, or auger mines was mechanically cleaned.

Lawrence County ranked second in total clay production and third in the production of both fire clay and miscellaneous clay. Fire clay mined at open pits near Enon Valley was sold to manufacturers of refractories and heavy clay products. Metropolitan Brick, Inc., produced both fire clay and miscellaneous clay at its Midland quarry. Fenati Brick Co., Inc., and Bessemer Cement Co., Division of Diamond Alkali Co., produced shale for their own use from pits near New Castle and Bessemer, respectively. Fire clay mined and hauled under contract for NATCO Corp. was used at its East Palestine, Ohio, plant.

Construction sand and gravel was processed at two plants near New Castle. Mahoning Valley Sand Co. processed construction sand and gravel and a small quantity of industrial sand at its West Pittsburg plant.

Reed-sedge and humus peat, sold in bulk, was produced by D. M. Boyd near New Wilmington. Humus peat was recovered from bogs in Washington Township by Moore's Humus & Nursery. Zonolite Co. exfoliated crude vermiculite shipped from Montana and South Carolina, at its Ellwood City plant.

Lebanon.—Bethlehem Cornwall Corp., a subsidiary of Bethlehem Steel Co., operated the Cornwell mine 5 miles south of Lebanon to produce magnetite ore. The crude ore was mined by block caving and processed at the company's Lebanon concentrator by flotation, magnetic concentration, and agglomeration, yielding iron ore, gold, silver, copper, cobalt, and pyrite.

Lebanon County was third in lime production. Quicklime and hydrated lime were produced by H. E. Millard Lime & Stone Co. at its Annville plant. Some quicklime was sold for agricultural use, and quicklime and hydrated lime were sold chiefly for construction, metallurgy, water purification, and papermaking.

Four producers crushed and sold or used limestone principally for blast-furnace and open-hearth flux, the manufacture of cement and lime, concrete aggregate, and roadstone. Total output was 1,294,000 short tons, 23 percent less than in 1960. Quarries were operated near Lebanon, Cornwall, and Annville. Forty percent of the stone was shipped by rail.

Output of anthracite by dredging operations exceeded that of 1960. Mineral specimens of magnetite and iron ore were collected near Cornwall.

Lehigh.—Lehigh County was the second largest cement producing county. General use and moderate heat, high-early-strength portland, and masonry cements were produced. Plants were operated near Coplay, Cementon, Fogelsville, and Egypt. Mostly captive cement rock was used as raw material, but limestone, gypsum, clays, sand, iron ore, mill scale, and pyrite cinders, also were consumed in making cement. Most of the material was shipped by railroad, in bulk, intrastate, and to New Jersey and New York.

New Jersey Zinc Co., Friedensville, mined zinc ore at its Friedensville underground mine by the room and pillar method. Zinc concentrate was shipped by truck to the company smelter at Palmerton.

Output of cement rock and limestone was 2,159,000 short tons, 3 percent less than in 1960. The Whitehall Cement Manufacturing Co., Cementon; Coplay Cement Manufacturing Co., Coplay; Giant Portland Cement Co., Egypt; and Lehigh Portland Cement Co., Fogelsville, quarried and crushed cement rock at local plants and utilized the stone for manufacturing cement. Lehigh Stone Co., Ormrod; Eastern Lime Corp., West Coplay; and Roy J. Kern, Guthsville, quarried and crushed limestone for concrete aggregate and roadstone. Some of the stone was sold to nearby Government agencies for road material. Penn Big Bed Slate Co., Inc., produced and processed slate at its No. 2 quarry near Slatedale, chiefly for structural and sanitary uses, blackboards, bulletin boards, and standard roofing slate. Gem-quality specimens of agate, jasper, chalcedony, limonite, and corundum were collected in southeastern Lehigh County. Pennsylvania Perlite Corp., Allentown, expanded perlite shipped from mines in Colorado. The material was marketed mainly as a building plaster aggregate, loose-fill insulation, and concrete aggregate.

Luzerne.—Luzerne County continued to rank second in the production of anthracite. Anthracite production totaled 5,593,000 tons and was slightly less than in 1960. Shipments by truck exceeded rail shipments by more than 3 percent. Anthracite was recovered from

underground mines, strip pits, and culm banks. Leading producers were Glen Alden Corp., Number One Contracting Co., Jeddo-Highland Coal Co., and Susquehanna Coal Co.

Plants near Wyoming, Avoca, Hazleton, Forty-Fort, Drums, and Nescopeck processed sand and gravel as building and paving material. Output of sand and gravel decreased 19 percent in 1961; it was the least output since 1955.

Sandstone was produced by four operators of quarries near Sweet Valley, White Haven, Jenkins Township, and Jackson Township; the stone was crushed and sold mostly for use as concrete aggregate and roadstone.

Moss, reed-sedge, and humus peat was recovered from bogs near White Haven by Pennsylvania Peat Moss, Inc. Humus peat was recovered from a bog near White Haven by Blue Ridge Soil Pep Co., Inc.

Hazleton Brick Co., Hazleton, used miscellaneous clay to manufacture building brick.

Lycoming.—Lycoming Silica Sand Co. quarried and crushed limestone at the Lime Bluff quarry, Muncy and the Pine Creek quarry, Jersey Shore, principally for concrete aggregate and roadstone. In addition, crushed limestone for agricultural purposes was produced at the Pine Creek quarry. Susquehanna Quarry Co. operated a quarry and a portable plant near Jersey Shore to produce limestone for road material. Some of the stone was sold to nearby Government agencies for road construction. Callahan & Haines Stone Co., Slate Run, produced dimension sandstone as rubble, irregular-shaped construction stone, and flagging stone. Ground slate was produced by Keystone Filler & Manufacturing Co., Muncy.

The combined production of J. A. Eck & Sons, Inc., and Lycoming Silica Sand Co., both of the Montoursville area, placed Lycoming County third in total sand and gravel output. In addition to the sand and gravel produced for paving and construction needs, sand was utilized as industrial sand.

Two underground mines and three strip mines were operated for the production of bituminous coal. The entire production from the underground mines was produced by hand methods. At the strip mines, three power shovels and two draglines were used. None of the coal produced was mechanically cleaned.

Penn Paint & Filler Co., Antes Fort, and Keystone Filler & Manufacturing Co., Muncy quarried tripoli (rottenstone). After crushing, drying, and pulverizing, the material was marketed for use as an abrasive and filler.

McKean.—Plastic fire clay recovered by Kaul Clay Products Co. near Clermont was used for hot tops for the steel industry. Kness Bros. produced two types of fire clay (plastic and burley) for use in foundries and steel mills. Floor and wall tile and building brick were manufactured from shale produced by Hanley Co. near Lewis Run.

C. L. McGavern, Jr., recovered industrial sand from a pit near Bullismills. Bituminous coal was produced only from strip mines. Two mines were active, using 18 power shovels and 14 draglines. None of the coal produced was mechanically cleaned.

Mercer.—Bituminous coal was produced from 2 underground mines and 11 strip mines. At the strip mines, 18 power shovels and 14 draglines were used. Three cutting machines and one mechanical loading machine were used at the underground mines. None of the coal produced underground or from the strip mines was mechanically cleaned.

Combined output from four plants near Mercer, South Pymatuning Township, Sharon, and Sharpsville increased 27 percent over 1960 and was only slightly below the previous high established in 1958. White Silica Sand Co., Greenville, quarried and crushed sandstone principally for furnace or converter lining, road material, and for use in foundries.

Mifflin.—Bethlehem Limestone Co. operated the Naginey quarry near Milroy and crushed limestone chiefly for use as blast-furnace flux, concrete aggregate, roadstone, and stone sand. Honey Creek Lime Co., Reedsville, and Ehrenzeller Lime Co., McVeytown, produced and crushed limestone for manufacturing cement. Quartzite, crushed and ground for making silica brick, was utilized at the local plant of Haws Refractories Co., Hawstone.

Industrial sand produced by Pennsylvania Glass Sand Corp. at its McVeytown operation was used for glass manufacture, molding, grinding and polishing, engine sand, and miscellaneous industrial uses. In addition to molding and engine sand, Miller Silica Sand Co., Barnham and James R. Klines Sons, Lewistown, processed construction sands. George E. Miller Coal Co., McVeytown, produced sand and gravel for construction needs.

Quicklime for agricultural uses was produced at the seven-draw-kiln plant of Ehrenzeller Lime Co., McVeytown. Honey Creek Lime Co. produced and sold hydrated lime for agricultural use at its continuous hydrator plant near Reedsville.

Monroe.—Hamilton Stone Co., Bossardsville, quarried and crushed limestone for use as concrete aggregate, roadstone, and asphalt fill. Some of the stone was sold to the Pennsylvania Department of Highways for road construction. Universal Atlas Cement Division of United States Steel Corp. produced white clay near Kunkletown for use at its cement plant. Sheesley's Minerals, Inc., Kunkletown and Steward and Clyde White, Stroudsburg, prepared sand and gravel for construction use. Output of sand and gravel continued to decline and reached its lowest level since 1955.

Montgomery.—Production of stone was nearly 4 million short tons. Although tonnage and value declined slightly, Montgomery County remained the second largest stone-producing county. Two quarries operating near Conshohocken and Norristown produced crushed and broken limestone for use as concrete aggregate and roadstone. Captive limestone quarried and crushed near West Conshohocken was used for manufacturing cement. Two quarries and plants near Plymouth Meeting and Bridgeport yielded crushed limestone principally for blast-furnace and open-hearth flux, concrete aggregate, roadstone, lime manufacture, and agricultural purposes. Fifty-eight percent of limestone was transported by truck and the remainder by rail and unspecified means. Montgomery Stone Co., Inc., Montgomeryville, quarried dimension basalt as rough and dressed structural stone and crushed basalt for road material. Basalt quarried near Saratoga and

Perkiomenville (traprock) was crushed and broken for concrete aggregate, roadstone, and railroad ballast. Dimension sandstone, chiefly for use as irregular-shaped stone, was quarried near Norristown and Glenside. Fire Stone Products Co., Glenside, produced dimension quartzite for use as rough architectural block and crushed stone for refractory linings in steel-producing furnaces.

Mignattie Construction Co., Inc., Bethayres, produced mostly crushed granite for use as concrete aggregate and roadstone and a small quantity of dimension granite for rubble and irregular-shaped construction stone. Irregular-shaped dimension stone for building retaining walls was quarried at the Hill Crest quarry near Laverock by Marcolina Bros., Inc.

Allentown Portland Cement Co. produced Types I–II, general use and moderate heat, air-entrained and non-air-entrained portland cements and masonry cement from captive limestone and cement rock at its No. 2 plant at West Conshohocken. Three rotary kilns were operated. Most of the material was shipped by rail, intrastate and to New Jersey, to ready-mixed concrete companies.

Six shaft kilns and three continuons hydrators were operated at the Plymouth Meeting plant of G. & W. H. Corson, Inc., to produce mostly hydrated lime for construction, chemical and industrial uses, and agricultural lime. Some dead-burned dolomite for refractory use also was produced.

Total clay production was virtually the same as in 1960. Although The Keller-Whilldin Pottery Co. North Wales clay pit was idle, the company used clay from stock to manufacture pottery products. Robinson Clay Products Co., Pottstown, produced plastic fire clay and miscellaneous clay for making vitrified sewer pipe. Norristown Brick Co., Norristown, produced miscellaneous clay for making building brick. Philadelphia Brick Co., Trappe, used shale mined under contract to manufacture drain tile and flues.

William Bambi & Sons, Inc., processed building sand and gravel at its plant near Norristown. Zeolite, ankerite, galena, quartz crystals, and copper minerals were collected by hobbyists and for use in making costume jewelry. Crude perlite from mines in Colorado was expanded by The Philip Carey Manufacturing Co., Plymouth Meeting, and Refractory & Insulation Corp., Port Kennedy.

Montour.—Lycoming Silica Sand Co., Milton, quarried and crushed limestone for concrete aggregate, roadstone, and agricultural purposes. Mausdale Quarry Co., Danville, quarried and crushed limestone for use as concrete aggregate and roadstone. Some of the stone was sold to the Pennsylvania Department of Highways and to local municipalities and townships for road construction. A small quantity of sand and gravel was recovered by Thomas Sand & Gravel Co. near Danville.

Northampton.—Northampton County remained the leading cement-producing county. The quantity and value of cement shipments increased 6 and 5 percent, respectively. Nine companies operated 11 plants, manufacturing cement from captive limestone and cement rock and from purchased raw materials, mostly sand, clays, gypsum, and iron ore. General use and moderate heat, and high-early-strength portland cements and masonry cement were produced. Sixty-one

percent of the cement was shipped by rail, mostly in bulk, to ready-mixed concrete companies and manufacturers of concrete products. Plant operations were near Nazareth, Bath, Martins Creek, Stockertown, Broadhead, and Northampton. Lehigh Portland Cement Co. reported a general shutdown of its Sandt's Eddy plant, Northampton, and made shipments of portland cement from stock.

Northampton County continued as the leading stone-producing county; output decreased 5 percent in quantity but increased 1 percent, in value, compared with 1960. Eleven firms produced limestone or cement rock from quarries near Nazareth (4), Northampton (2), Martins Creek, Stockertown, Bath, Broadhead, and Bethlehem. Most of the cement rock was utilized at the company plants for manufacturing cement, and as concrete aggregate and roadstone. Smaller quantities were used as stone sand and railroad ballast and for agricultural purposes. Northampton County was again the principal source of slate; production decreased 12 percent in quantity and increased 11 percent in value, compared with 1960. Slate was recovered from nine mines (two less than in 1960), four near Pen Argyl, two near Bangor, and one each near Bath, East Bangor, and Plainfield Township. The processed slate was used chiefly for structural and sanitary ware, blackboards, standard roofing, and flagging.

Sand and gravel production exceeded by 23 percent the previous high established in 1960. Material processed at plants near Portland, Easton, Bangor, and Hellertown was shipped to consumers by truck. A smaller quantity of anthracite was produced.

Northumberland.—Anthracite production decreased 19 percent, compared with 1960, and Northumberland continued to rank third among the anthracite-producing counties. Anthracite was mined from underground mines, strip pits, culm banks, and river dredging. Principal producers were Gap Anthracite Co., Treverton Coal Co., and Sayre Contracting Co.

Two companies near Watsontown used shale to make building brick. Watsontown Minerals Product Co., Watsontown, used shale, mined several years before, as a filler in linoleum. Limestone quarried near Herndon and Sundbury was crushed for use as road material, for agricultural purposes, and for lime manufacture. M. E. Wallace Co., Danville, discontinued sand and gravel production in 1960. Structural and fill sand was prepared by Wilson's Sand Plant, Montandan, in 1961. Quicklime for agricultural purposes was produced and sold by Clyde Starook, Northumberland.

Perry.—Limestone was quarried near Newport by Bradford Hills Quarry, Inc., and crushed for use as concrete aggregate and roadstone. Some of the stone was sold to the Pennsylvania Department of Highways and local townships for road construction.

Philadelphia.—The Liberty Corp. dredged and processed building sand and gravel near Philadelphia. Shipments to consumers were made by barge.

Gulf Oil Corp. recovered sulfur as a byproduct in the liquid purification of oil refinery gas at its Philadelphia plant, using the Claus process. Atlantic Refining Co. recovered hydrogen sulfide by the Girdler system, using diethanolamine and monethanolamine.

Potter.—Dimension sandstone was recovered from four quarries, one each near Roulette, Oswago, and two in Austin. Most of the stone was used as flagging stone and rough construction stone.

Schuylkill.—Schuylkill County ranked first in output of anthracite, producing 39 percent of the State total tonnage and value. Underground mines, strip pits, culm banks, and river dredges were operated during the year. The principal producers were Greenwood Stripping Corp., Reading Anthracite Co., Gilberton Coal Co., and Honeybrook Mines Inc.

Pennsylvania Aggregates, Inc., Summit Station, sold limestone as road material from stockpile. Huss Contracting Co., Andreas, quarried and crushed limestone for use as concrete aggregate and roadstone. Quartzite, quarried and crushed for use in manufacturing silica brick, was produced at the Andreas quarry, Andreas, by Harbison-Walker Refractories Co.

Refractory Sand Co., Inc., processed fire sand and furnace sand at its Andreas plant. Schuylkill County was the leading miscellaneous clay producing county. A substantial quantity of miscellaneous clay was consumed by Lehigh Materials Co. in its lightweight aggregate plant. Auburn Brick Co. used miscellaneous clay from a pit near Auburn for making building brick. Quartz crystals were collected as mineral specimens.

Snyder.—Production of shale decreased 28 percent from that of 1960. Paxton Brick Co., Paxtonville, and Glen-Gery Shale Brick Corp., Beavertown, produced shale for making building brick.

National Limestone Quarry, Middleburg, quarried and crushed limestone and sold it for use as concrete aggregate, roadstone, and for agricultural purposes. Carton L. Comfort, Mount Pleasant Mills, quarried and crushed limestone for use in manufacturing lime. Quicklime was produced at the company's local six-pot-kiln plant and sold as agricultural lime.

Anthracite production was less than in 1960. Central Builders Supply Co. processed and sold building sand and gravel and paving sand from its plant near Selinsgrove.

Somerset.—Somerset County again had the largest number (100) of underground bituminous coal mines (1 less than in 1960). Underground production totaled 1 million short tons; 61 percent was mechanically loaded using 76 loading machines. Seventy-two power shovels, 36 draglines, and 84 bulldozers were used at the strip mines. Only about 19 percent of the county output was mechanically cleaned, using wet washing and pneumatic methods. One auger mine active in 1960 was not active during 1961.

Fire clay from pits near Berlin, Fort Hill, and Springs and from an underground mine at Hollsopple was used in the manufacture of refractories and heavy clay products. Two underground and one open-pit mines were inactive during the year.

Somerset Limestone Co., Inc., produced and crushed limestone at its Bakersville quarry and plant solely for road material. Keystone Lime Co., Springs, quarried and crushed limestone for use as concrete aggregate, roadstone, and for agricultural purposes. A new producer in the county, Rodamer Concrete Products, Springs, quarried and crushed sandstone for use as concrete aggregate and roadstone. Small

quantities of sand for various uses were recovered by Robert D. Shaulis and Boswell Sand Co. both near Boswell.

Sullivan.—Anthracite, the only mineral produced in the county, was mined from one underground mine and one strip mine. The output was transported entirely by truck. Bliss Coal Co. was the principal producer.

Susquehanna.—Dimension sandstone (bluestone) was quarried and used mostly as flagging stone; smaller quantities were used for irregular-shaped rough construction stone and rubble. Seven quarries were operated near Kingsley, Springville, New Milford, and Brooklyn Township. Keelor Supply Co., Inc., quarried and crushed sandstone for road material at Bennett's quarry near Clifford. Most of the stone was sold to the Pennsylvania Department of Highways and nearby boroughs and townships for road construction. Anthracite production increased substantially.

Tioga.—Bituminous coal was produced from two underground mines and six strip mines. Sixteen power shovels, 8 draglines, and 13 bulldozers were used at the strip mines. All of the coal produced underground was mined and loaded by hand methods.

Union.—Crushed limestone, used principally for concrete aggregate and roadstone, was quarried near Winfield and Mifflinburg. The Pennsylvania Department of Highways purchased some of the stone for road construction.

Venango.—Bituminous coal was produced from one underground and five strip mines. Eleven power shovels, 4 draglines, and 13 bulldozers were used at the strip mines. Only one mechanical cutting machine was used underground, and none of the underground production was loaded mechanically. Approximately 80 percent of the coal was mechanically cleaned.

Industrial Silica Division of Pennsylvania Glass Sand Corp. recovered and processed industrial sand at its Venango works. Material recovered by dredge was processed by Oil City Sand & Gravel Co. at its plant near Oil City to supply demand for building and paving sand and gravel. White City Sand & Gravel recovered bank run gravel from a pit near Titusville.

Warren.—General Concrete Products Corp. prepared building and paving sand and gravel obtained from its dredging operation near Star Brick. Nelson and Ellberg, Warren, processed sand and gravel for construction needs. Warren Sand & Gravel Co., Inc., Warren, expected to complete construction of its plant in May or June of 1962.

Washington.—Washington County was second in the production of underground bituminous coal. Twenty-one mines were operated to produce 9.4 million tons. Fifty-three cutting machines and 145 mechanical loading machines were used underground. Virtually all of the coal was mechanically loaded and mechanically cut. Twenty-four strip mines were active, two more than in 1960; they used 34 power shovels, 8 draglines, 3 carryalls, and 30 bulldozers. Most of the coal mined in the county was mechanically cleaned, primarily by jigs and other wet washing methods.

Washington Stone Co., Inc., produced crushed limestone for road material at a quarry and stationary plant near Washington. Fry Coal & Stone Co., Division of Martin Marietta Corp., operated the

Claysville Portable No. 3 quarry and plant near Washington to produce crushed and broken sandstone solely for use as concrete aggregate and roadstone. Donley Brick Co. mined red shale from a pit near Washington for use at its local plant for making building brick. Westmoreland Clay Products Co. was inactive during the year.

Wayne.—W. R. Strong & Son and Paul Thompkins Estate reported output of dimension sandstone principally for use as flagging stone; smaller quantities were used as dressed or cut architectural stone, rubble, and flagging stone. Wayne Crushed Stone, Inc., produced crushed and broken sandstone for concrete aggregate, road material, and riprap at the Damascus quarry and the Lake Ariel quarry and plant.

Wayne County led in peat production. Output increased in tonnage but decreased in value. Wayne Peat Humus Co. recovered humus and moss peat from bogs near Gouldsboro. A small quantity of anthracite was produced and transported to consumers by truck. Willis R. Black continued to supply farmers in the area with building sand and gravel and sand for fill.

Westmoreland.—Bituminous coal was produced from 43 underground mines, 5 less than in 1960, 25 strip mines, 5 more than in 1960, and 2 auger mines, the same number as in 1960. Almost all of the coal mined underground was cut using 59 cutting machines, and mechanically loaded, using 60 loading machines. At the strip mines, 30 power shovels, 5 draglines, 2 carryalls, and 23 bulldozers were used. About 80 percent of the county production was mechanically cleaned using jigs, other wet washing methods, and pneumatic methods.

Limestone was quarried and crushed for road material near Jeannette and Lower Burrell. Ray Branthoover and John C. Beaumont, both near Belle Vernon, quarried dimension sandstone for rubble. Dimension sandstone, solely for use as flagging stone, was quarried at Lynn's Quarry, Belle Vernon. Four producers operated quarries near Greensburg, Baggaley, Ligonier, and Murrysville and produced crushed and broken sandstone used solely for road material.

Wyoming.—Reduced demand for sand and gravel for highway construction was responsible for a sharp decline in production, compared with that of 1960. Wyoming Sand & Stone Co., Falls, processed construction sand and gravel and a small quantity of industrial sand at its Price plant. Construction sand and gravel also was processed by East Falls Sand & Gravel, Falls, and The East Lemon Sand & Gravel Co., East Lemon.

York.—Medusa Portland Cement Co. utilized captive crushed limestone for manufacturing portland cement at its six-rotary-kiln plant at York. Waterproof white and gray portland cements and mortar cement were produced by the dry process. Sixty-three percent of the material was shipped by truck and the remainder by rail, mostly to building material dealers and manufacturers of concrete products.

York County ranked third in value of stone production, with an 11-percent increase in both quantity and value over the corresponding 1960 figures. Limestone was produced at 10 operations, 7 near York and 1 each near Mount Wolf, Wrightsville, and Thomasville. Chief uses of the crushed and broken stone were as concrete aggregate, and roadstone, for cement and lime manufacture, and as blast-furnace and

open-hearth flux. Smaller quantities were sold or used for agricultural purposes and as railroad ballast. Fifty-six percent of the stone was transported by truck, and the remainder, by railroad and unspecified means. Crushed and ground slate at the Delta open quarry and plant of The Funkhouser Mills, Division of the Ruberoid Co., was marketed as natural granules and flour. Some of the slate flour was exported to Canada and Puerto Rico.

York County again ranked second in lime production, with a 4-percent increase in both tonnage and value over 1960. Lime, produced in two coal-fired rotary kilns at the J.E. Baker Co. York plant, was sold as deadburned dolomite for refractory material.

Output of sand and gravel continued to decline from the high established in 1959. All the material processed at plants near York, York Haven, and Mount Wolf was delivered to consumers by truck. Miscellaneous clay and shale produced by Medusa Portland Cement Co. and Glen-Gery Shale Brick Corp. near York were used in the manufacture of cement and building brick, respectively. Mica (sericite) schist processed by drying and air separation was sold for use as paint, rubber (mold lubricant), and welding rods. General Mining Associates, Glenville, was the only mica producer in the State. Pennsylvania Perlite Corp., York, expanded crude perlite mined in Colorado.

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